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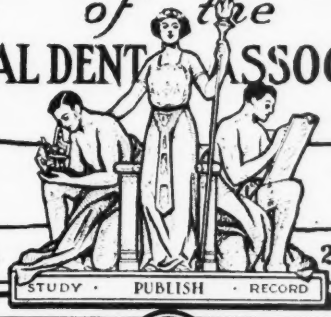

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FEBRUARY, 1919

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New Orleans Meeting a Great Victory Session. —*Editorial.*

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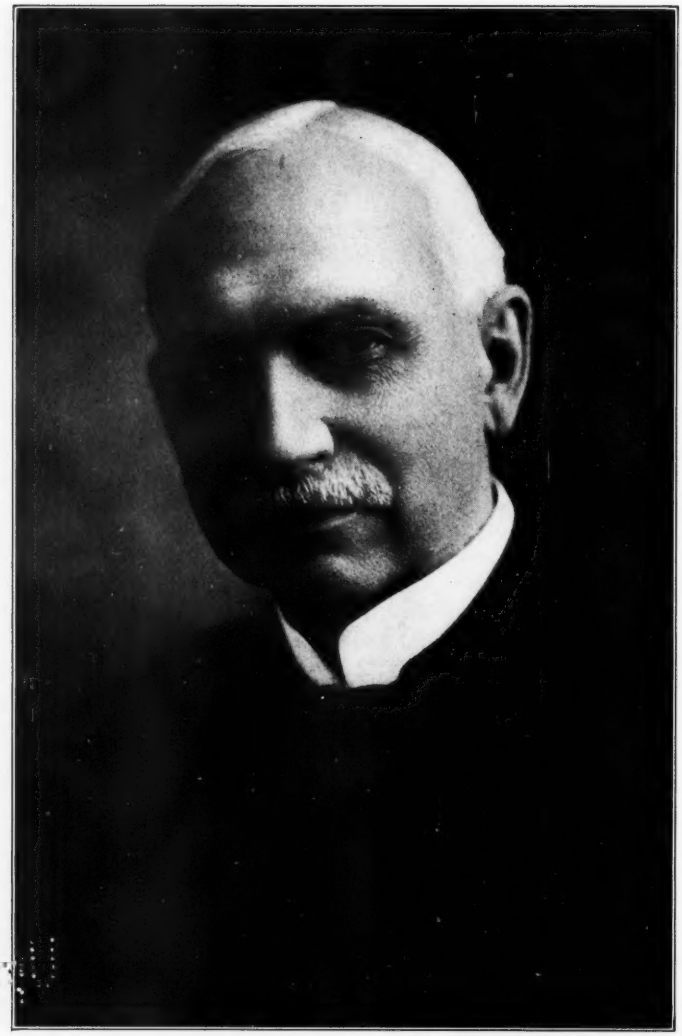

C. N. JOHNSON, M. A., L. D. S., D. D. S., CHICAGO, ILLINOIS.
For Sixteen Years Editor of Dental Review.

THE JOURNAL
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Original Communications.

THE GENERAL IMPROVEMENT OF TECHNIC IN CROWN AND BRIDGE WORK.

(FROM A TEACHER'S POINT OF VIEW.)

By Forrest H. Orton, Professor of Crown and Bridge Work in the College of Dentistry, University of Minnesota.

(Read before the National Dental Association at Its Twenty-Second Annual Session, Chicago, Ill., August 5-9, 1918.)

WITH the possible exception of the root canal problem, no phase of dentistry has of late years received so much attention by way of destructive criticism as the subject of crown and bridge work. And it is a pertinent fact that the dissatisfaction thus expressed is not confined to any one section of the country, but is well nigh universal. This dissatisfaction is by no means ill founded. A slight acquaintance with our literature is of itself sufficient to show a thoughtful person that the results obtained in our branch of dentistry are not commensurate with the results obtained or the standards set in other fields of restorative dentistry.

To be sure, the mechanical ingenuity which has been directed toward perfecting the methods of what one writer has called "safe and sane" crown and bridge work, is as such worthy of all admiration. Yet it is a humiliating fact that these efforts, skilful as they are, have had to be so largely stimulated from without—especially by the challenge which has been brought against our work by the medical profession, the accusa-

tion that we have been placing products of our technical skill in the mouths of patients such that the work we have done for them really constitutes a serious menace to the public health.

It would not be fair to say this without at the same time calling attention to the excellent individual technic evolved and applied, in almost every section of the United States, by a few dentists of unusual ingenuity and power. The public exhibition and display of such skill constitutes the most attractive and admirable feature of our conventions. It is one of the most notable ways we have yet found to elevate the standards and to improve the practice of our art generally thruout the profession.

Nevertheless, I have long thought that this method, useful as it has proved itself to be, falls far short of meeting all the requirements of the situation. There is undoubtedly created in the minds of those who attend such clinics some sort of ambition or desire to imitate the successes thus publicly paraded. But I hardly think it can be reasonably expected that any general reform of our practice will be brought about by such efforts alone. I doubt if any one but a genius for observation and imitation could grasp the minutiae and the detail involved in such exacting technic as is usually displayed. We sometimes learn some little "stunt" at a convention—an improvement or short cut or time saver in the routine procedure of an operation. But who is there of us that has not repeatedly been disappointed in his attempt to make practical application of some beautiful technic of a method, which when observed at a convention generated the highest expectations? We find that the memory has retained only the outstanding features—the headlines, so to speak—but that the equally essential details and connecting links of procedure have been forgotten, or had failed to impress us at the time.

The attempt to learn in this way is an attempt to learn by imitation thru trial and error. Perhaps our primitive ancestors had no better way of learning new adjustments. It is true at any rate that children of the kindergarten age resort to it almost exclusively; and it is certain that in every age and for many purposes this method of trial and error retains its usefulness. But it has the great disadvantage of being blind at the outset. It calls for a reaction which has not been completely mastered. Repeated failures occur in the process of learning; which, to be sure, gradually correct themselves, if the learner is fortunate or skilful. But no one can deny that the process is slow and wasteful. And it is not an infrequent experience to find that some lost or neglected link of procedure makes utter failure in the application out of the most perfect technic.

Hence it has come to be my settled conviction, a conviction which I take the liberty of expressing here and in this address, that our conventions must apply themselves to the utilization of recognized pedagogical methods if they wish to increase their usefulness and effectiveness in raising the general level of workmanship in the profession. By these recognized pedagogical methods, I mean especially those which have proved their value in drilling and habituating students to certain standards of workmanship in manual dentistry.

Many years of experience in attendance upon the meetings of dental societies have contributed to the formation of these convictions. Such meetings represent a great expenditure of time and money and energy in the aggregate, and frequently also for the individual member in attendance. They thus face a grave problem from the merely economical standpoint, in the necessity of justifying their existence. One of the essential functions of all such meetings is to provide opportunities for the increase of

technical skill among the members in attendance. But this essential function is not infrequently lost sight of in consequence of the natural desire of those in charge of the arrangements to register for that particular convention a record-breaking attendance. The great expectations raised by the published program are often disappointed. After struggling for some point of vantage at a clinic, and perchance being so fortunate as to succeed in maintaining it, we become the witnesses of a beautiful operation; *but we do not learn how to perform it for ourselves.*

The clinician may be doing his best in the difficult task of interpreting with his fingers thoughts that he cannot express adequately in words. But since the nature of his work is such as to require at all times an absolute concentration, it is too much to expect him to give an adequate and clear running explanation paralleling his technical procedure. The attempt to do this is usually at the expense of the efficiency of both. I believe, therefore, that the clinician who has a new principle or an improved method to propose to his fellow dentists, should by all means be given the opportunity to explain each step *before* beginning his clinic. This will help each member of the group to understand the fundamental principles involved. If in addition to this help, and to the advantage of seeing the technic applied, each member of the group were also given the opportunity of doing the work himself under proper supervision, the weakest feature of the trial and error method above described as involved in our customary procedure would be eliminated, and our conventions would begin to become very much more useful, and very much more capable of justification from the standpoint of the good of the profession.

The learning of a technic means the acquirement of a certain habit. The finest achievements of life are realized only thru the patient building up and the careful co-ordination and chaining together of habits. And progress beyond the slow and laborious processes of the learning period depends absolutely on the formation of habits of some kind, habits of thought or of feeling or of action. Now, these habits may become our friends or our enemies. For habit simply means a tendency, guaranteed to us by the nature of our nervous system, to do or to be that which we have done or been before, with the advantage of doing it more easily and with less consciousness and expenditure of energy. So we learn to do by doing; but it follows as a corollary from this truth that we learn to do incorrectly by doing incorrectly. We would evidently be more apt to learn to do correctly, if our first and therefore most important attempts were conducted under supervision. The lack of proper assistance and supervision during the formative period of the learning process is certainly one of the chief causes of inefficiency, and one of the conditions most responsible for failures in the making of crowns and bridges. Those of you who have had some experience in conducting study clubs will doubtless agree that the difficulty of having to overcome old pernicious habits is one of the most discouraging features of the attempt to produce an increase of efficiency. A thing once learned is never entirely unlearned, but remains to block the way of newer and better adjustments. Relearning, with its accompaniment of unlearning, is therefore frequently much more difficult for the practitioner than the original process of learning. And the old habit may be submerged for a long time; but when we are excited or in a hurry, or just when we are striving the hardest for a perfect performance, out may come the old incorrect response, and our work is made the victim of a sloppy instrumentation.

This brings me naturally to speak of

a still more fundamental condition for raising the level of efficiency in the profession. I refer to the training of students in our dental colleges. It is perfectly obvious that there are many desirable habits necessary to the acquirement of an adequate technic in crown and bridge work which are not so easy and pleasant and simple that they stamp themselves in without effort or discipline. For our most difficult technic there are many conditions with which the student should be made conversant in the earliest stages, and many helps to the formation of the best habits of which he should be able to take advantage. The bad habits which constitute hindrances to efficiency he should be warned against; but he should not only be warned against them, he should actually be prevented from acquiring them.

The modern method of individual or elbow instruction has proved the most successful means of attaining this result. My own opinion, based on many years experience, is that such intensive training as is here intended will require at least one instructor for every fifteen students in the technic department, and one instructor for every ten students in the teaching of the practical application.

Didactic instruction in the form of lectures may be successfully employed in teaching the theory and the fundamental principles of a subject to a larger group or to an entire class. But it is a waste of time to teach mechanical processes in this way, or rather to pretend to teach them in this way. For we learn to do only by doing; and the greatest efficiency as well as the greatest economy of effort is attained by doing under proper supervision.

I am aware of the fact that this estimate of the number of teachers necessary to successful instruction in crown and bridge work will not receive the wholehearted approval of our administrators. And I am free to explain that this is the principal reason why I am presenting the matter here in this gathering, rather than at a meeting of the Dental Teachers' Association. For I wish to make these facts generally known; and a campaign of publicity may make better things possible in a generation, if not somewhat earlier. The objection is, of course, that the right way of teaching this subject is too expensive. But this is an objection which cannot in the long run stand the test of criticism.

It is not my intention to cover up the shortcomings that must be laid at the door of the teachers of crown and bridge work themselves. The majority of us are innocent of any pedagogical training, and we are probably doing the best we can under the circumstances. There are undoubtedly some whose interest in their work of teaching is merely casual, and incidental to their practice; but the greater number of those whom I have had the honor of meeting are earnest enthusiasts, sacrificing material interests for the privilege of giving instruction.

Perhaps the most severe commentary that can be made upon the teachers of crown and bridge work is that too many of them expect the students in their charge to adapt themselves to their individual technic, instead of choosing the more rational policy of adapting their own technic to the capacities of their students.

There may be a few vocations in modern life which men enter only because they feel an inner urge and impulse to express what is upon their hearts and minds, but every teacher knows that this is hardly true of dentistry. Every succeeding class seems to give an equally good occasion for the cracking of the old joke that many good farmers are spoiled to make many poor dentists. They come with little or no prevocational training; and what is more discouraging, only a small percentage discover any native talent for tak-

ing pains, or any large capacity for the observation of minute detail.

It is time we recognized this as a fundamental condition of our work, a condition, moreover, which bids fair to be permanent, or at least operative for a long time to come. It does little good to call this material offered to us a lot of "bone-heads" unfit for the profession, for it is nevertheless the stuff out of which the next generation of dentists must be made, if there is to be any next generation of dentists at all. It is time instead that we adapt our methods of teaching, and the technic of our procedure, to the capacities for learning which our students actually have.

It therefore goes without saying that a crown and bridge technic which requires a high degree of skill in the practitioner will necessarily be restricted to those few individuals who are capable of acquiring such skill, and will, therefore, not be a teachable technic. For only a technic that is suited to the capacity of the majority of our students as they actually are, not as we might wish them to be, is a teachable technic.

The difficulties inherent in the construction of the gold shell crown is a case in point. The mere mention of the shell crown calls up a vision of septic conditions. It suggests the presence of conditions favorable to the retention of stagnant saliva and of sordes; not infrequently it involves the decay of the proximating teeth, and constitutes the exciting cause of gingivitis.

That we have quite generally failed to teach the application of the shell crown with any degree of success must be apparent to all. There are undoubtedly several reasons for this failure. But the cause I wish most to emphasize here is that the various steps involved in the technic of its construction are such as to present almost insurmountable difficulties to the average man. What we need here, unless we are so happy as to be teaching only geniuses, is some technic that can be applied successfully, so as to leave the field of operation in a favorable condition.

I am not condemning the banded crown as such. I believe that the use of a ferrule is under some conditions good mechanics; but I also perceive that there are limitations upon its usefulness. That a banded crown is frequently applied by dentists where it is not indicated is of course no reason for condemning its use where it is indicated. The dictum frequently heard that crowning should be the operation of last resort implies that a crown should be made only when all other operative procedures at our command would prove inadequate to meet the situation. But this means that in no other branch of restorative dentistry are we confronted with as many unfavorable conditions as in crown and bridge work. We have, for example, loss of the interproximate space, loss of gum contour, change in the occlusal plane of the opposing tooth, etc., etc. And these are but some of the most common difficulties we have to overcome before we can hope to restore normal function. And at the present time we have no general theory to guide us in dealing with these stumbling blocks, but must rely upon the judgment and knack which our individual experience may have been able to give us. And the mechanical dexterity employed is not of itself sufficient to insure conditions approximating ideal hygienic standards.

Those of you who are not teachers would be amused and amazed if you could see the confidence with which a tyro will undertake to place a crown where the conditions are so unfavorable as to baffle an extraordinary mechanical talent of years of experience. A general theory of those conditions which are more or less constantly present where crowns are indicated would

be a valuable aid, not only to tyros and students, but to the experienced practitioner as well. It would furnish us with a standard of comparison on the basis of which to judge both the limitations and the advantages of the different types of crowns in common use, and of types which the future may bring forth.

Such a theory, involving a classification of conditions with their appropriate indications, if properly drilled into students, would have the effect of habituating them to the study of each individual case that comes before them in order to fix the specific problem presented. The problem once understood, there would then be room for the development of the mechanical ingenuity needed to solve it. Such a classification would have the further merit of exposing the hollowness of all panaceas, and the very real limitations inherent in all devices or methods claiming universality.

It is perfectly natural for each of us to have some favorable method on which to rely, but this is all the more reason why we should study to realize its limitations. For we all need to guard against what the logician calls the "bias of happy exercise," i. e., tending to favor the way which gives us as individuals most pleasure and satisfaction. Let me give a concrete example of what I mean. The routine method of making a banded crown is to adapt the band to the root in the mouth. When the conditions are favorable, i. e., when the root is in normal position and regular in its peripheral outline, with a normal gum curvature, it is possible for us to restore normal conditions by fitting the band to the root in the mouth as shown in Figure 1. This crown was fitted in the mouth and gave good service for a number of years.

Figure 1.

A CENTRAL RICHMOND CROWN.

The right hand figure was fitted to the root in the mouth. The left hand figure, a natural central, is simply for comparison.

Let us compare this with another situation which is frequently met with, especially in those cases where the tooth distal to the one to be crowned has been lost. The gum attachment on the mesial will be fairly normal; but on the buccal, distal and lingual there is considerable recession of the gum Figure 2. The tooth in this case is tipped mesobuccally out of alignment. Hence, in order to improve the occlusion and restore normal embrasure and contact, not only the enamel but a portion of the

Figure 2.

Four tipped bucco-lingually out of alignment the requirements necessitated not only the removal of the enamel but a portion of the dentine from the buccal surface resulting in a cone shaped root preparation. The gingival attachment was normal on the mesial but greatly receded on the distal and lingual.

Figure 3.

A plaster cast of the case shown in No. 2.

dentine had to be removed. This resulted in a very cone shaped preparation, as shown in Figure 3. I am convinced that the average dentist would fail in this situation to fit a band that would be in close apposition with the entire gingival circumference of the root. And yet the situation admits of a banded crown.

There is no reason why we should attempt to fit the band to the root in the mouth when the conditions are as unfavorable as shown in this case. The indirect method offers a road with few obstacles even to the men with mediocre talent.

It may be interesting to follow the various steps taken in this case, as it

Figure 4.

Figure 6.

Thirty-six gauge 24k gold plate swedged over the amalgam model.

Figure 5.

Buccal and Distal aspect of the amalgam model.

was the first effort of a student in the carrying out of this particular technic.

The preparation of the root was on a vital tooth as shown in Figure 4. The steps in taking an impression and making the amalgam model are practically the same as that employed in obtaining an impression and model for the manufacture of a jacket crown. The amalgam model used in this case is shown in Figure 5. 24 k gold, 36 gauge, is approximately burnished over the model. No attempt should be made to burnish

Figure 7.

Thirty-six gauge 24k gold plate swedged over amalgam model, and a second band of 28 gauge 22k gold plate driven to the gingival margin. The space between the pure gold cope and the second band is completely filled with 22k gold solder.

down the folds, as it makes the cope too thick at this point; cut out the folds and lap the cut ends. Complete the adaptation in a small swedger. Figure 6 shows the gold after it has been swedged to the model. A narrow band of 28 gauge 22 k gold is now fitted around the gingival margin and should reach from the gingival to the gingiva-marginal ridge. The space between the gold cope and the band is entirely filled with 22 k solder as shown in Figure 7. We have

Figure 8.

The same piece of technic as shown in No. 7 after the balance of the crown above the gingival marginal ridge has been restored in wax. It may now be verified and corrected by placing on the root in the mouth taken off and placed back again as often as necessary, without fear of distortion at the gingival.

Figure 9.

Made from a radiograph showing crown in position in the mouth. Notice the position of the alveolar septums on the mesial as compared to its position on the Buccal and Distal.

now obtained a fairly solid support for that section of the crown above the gingiva-marginal ridge which is to be modeled in wax. Figure 8 shows the wax restoration. The waxed up crown may now be placed on the root without fear of distorting the gingival fit, and the alignment and the embrasures and contact verified. Figures 9 and 10 show the finished crown in position. The principal advantage claimed for this method is that it allows us to use the natural jaw in adjusting the articulating surface. The usual method of constructing our crown entirely on a model of one small segment of the arch and the opposing teeth (See Figure 10 A) may enable us to make crowns that are in contact when the jaw is at rest. But this method is utterly useless as a guide in determining the relation of the occlusal surfaces of the teeth during the movements of the mandible. If the generally acknowledged principles of occlusion and articulation are correct, the only safe procedure of constructing our crowns or bridges entirely on a model would be to take a full upper and lower impression and mount them on an anatomical articulator.' Even so, it is my belief that we will get better results by verifying the articulation in the mouth. The various anatomical articulators on the market no doubt register the condyloid path with sufficient accuracy to serve as a guide in the construction of an artificial denture; but in our crown and bridge operations the conditions are not parallel, owing to the increased rigidity and additional stress thrown on the abutment teeth. A merely approximate guide is not sufficient. Absolute accuracy is necessary if we are to avoid the evil results of traumatic occlusion.

Figure 10.

Perhaps no problem which confronts the teacher in crown and bridge work today is the source of greater perplexity than the question of devitalization. The dental profession seems to be divided into opposite and mutually hostile groups on this momentous issue. But our opinions are still mere opinions, for it is clear that we do not as yet fully understand the problem. And until we understand the problem, we can hardly be certain that we have solved it. Our knowledge of the anatomy of the root canals is very meagre, considering the importance which they assuredly have for modern dentistry. We have a limited knowledge

of the anatomy of typical teeth, and even less knowledge of variations. We have no morphology of the root canals, and we do not even know how the root end is closed. It is true that one authority of national reputation, whose prominence is based upon what seems to be the possession of a very accurate technic in the treatment of root canals, claims that 90% of them can be properly filled.

Figure 10 A.

Usual guide employed in constructing occlusal surface. This may be a guide as to the relation of the mouth while the teeth are at rest but it is not in the slightest degree a guide as to the relation of the teeth during the lateral movements of the mandible.

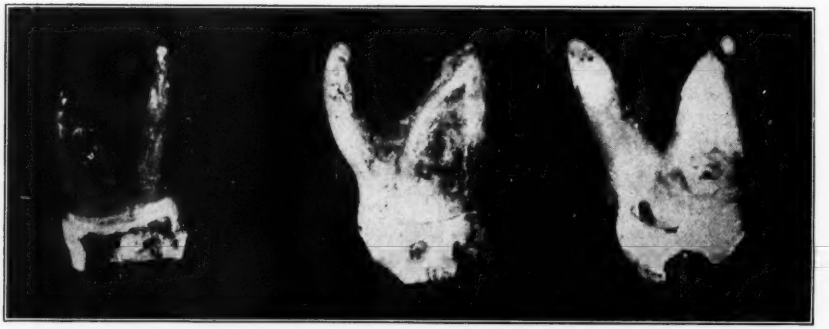
Another authority of equal prominence claims that 80% of all root canals can be filled. But these authorities do not tell us how they arrive at their exact statistics. No scientist can afford to assume infallibility. We do not question the integrity of these authorities, but under the circumstances it seems to me that we have a right to question their soundness of judgment.

I have been so impressed with the need of some exact data as an aid in checking up these apparently loose statistics that I have made what may perhaps best be regarded as a preliminary survey of a number of facts bearing on this issue. Upwards of 300 first, second and third upper molars were obtained from different sections of the United States. These were placed on charts, lined like a checkerboard, with 100 squares to the chart and numbered on two sides. In the first few rows were placed teeth which came true to type and on the remaining rows were grouped together teeth which had a certain character or variation in common. Surprising indeed was the result of the tabulation. I found certain variations occurring so frequently as to almost form a type in themselves. Ninety-four per cent of the first molars came true to type. This is something we might have expected, as the first molar is developed and erupted at a time when there is plenty of room. The greatest variation was found in the character of the curvature of the mesobuccal root, making it increasingly difficult to treat. Subsequent examination of the radiographs of diseased first molars in my possession showed the rarefied area on the mesobuccal root in 48% of the cases. I believe this fact is significant. Of the second upper molars 86% came true to type. The greatest variation was a flattening of the tooth mesodistally, forcing the distobuccal root toward the center of the tooth, tending to change the triangle to a straight line. Only 10% of the third upper molars came true to type. The greatest variation was in the tending to a fusion of the roots. Where this did not occur the buccal roots had a tendency to curve toward the buccal at the region of the apical third. What is more surprising is the fact that something over 4% had an extra root.

I was assisted in this work by Doctors Grove and Henry of St. Paul. We were

all convinced that the hindrances to the thoro treatment of these canals increased as we went toward the distal,

Figure 11.



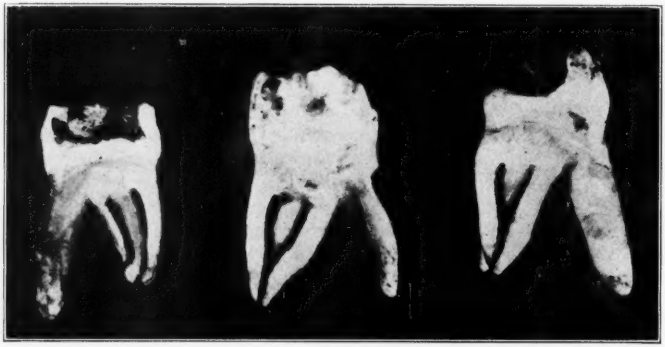
Mesial aspect of mesobuccal root of the first upper molar.

and that the percentage of upper molars that could be successfully treated and filled would be *less than* 80%.

Another surprising fact (surprising

pect more than one canal. It is broad from buccal to lingual and grooved on its flattened side. While these two canals usually merge before they reach the apical end of the root, yet they are frequently separated thruout the entire length of the root and have separate

Figure 12.



Same view of the same teeth after the root has been ground away so as to expose the root canals.

because I do not find it emphasized in the dental anatomies) is the frequent presence of two canals in the mesobuccal root of the upper first molar. The shape of this root might indeed lead us to suspect

foramina. Owing to the parallel direction of these two canals the radiograph would be of questionable value in exposing them. Figure 11 presents a mesial view of three typical mesobuccal

roots of the first upper molar, and Figure 12 shows the same view of the same roots after the root has been ground away so as to expose the canals to view. I confess that I would not have suspected this condition from my clinical observation alone. Deductions based on our knowledge of the embryology of root development might lead us to suspect small masses of organic matter between the normal canals in fused roots and this deduction seems to be verified in these specimens of translucent roots shown in the following, Figures 13, 14, 15, 16.

Figure 13.

Showing small masses of organic matter between fused roots of upper third molar.

Figure 14.

Showing anasto between canals, fused roots, upper third molar.

It seems to me that in this preliminary survey enough evidence has been elicited to make it clear that we cannot accept statistics based on radiograph showings and clinical deductions alone. And if I may be permitted a further suggestion it is this, that the research commission will find a fertile field of investigation in attacking this anatomical problem. That the more or less rhetorical statistics mentioned above have been uncritically accepted is evidenced by the fact that the majority of dental colleges have a general rule that teeth which are to be subsequently crowned must first be devitalized. It seems only fair to state that my information on this point comes from students in the various colleges; but this information seems to be further verified by statements of the teachers themselves in recently published opinions on this subject, notably Dr. Marcus Ward, of Ann Arbor, December Journal of the National Dental Association, and Dr. I. N. Broomell, in "I. of I." for March, 1917. Dr. Ward believes that the removal of the enamel from a tooth with a vital pulp increases the difficulty of the operation to such an extent as

to discourage the operator, and is sure to result in a faulty root preparation. Dr. Broomell believes that the hasty removal of the enamel cannot be accomplished without causing a retrogression in the pulp, and advises the removal of the pulp before it becomes diseased, as a prophylactic measure.

Dr. R. W. Bunting, of Ann Arbor, commenting on Dr. Broomell's article in a "Review of Dental Literature," in The Journal of the National Dental Association for November, 1917, says: "There is more than a little truth in the implied idea that the wholesale application of partial and whole crowns and large inlay restorations to vital teeth will result in a harvest of degenerating and dying pulps." I thoroly agree with Dr. Bunting's statement. At the same time it points to our great weakness, which is a lack of adequate diagnosis. I believe that it should be made an important part of our instruction to teach the student to differentiate between the cases when it might be safe to crown a tooth with a vital pulp and those in which it would not be safe to do so. The "wholesale application" of any one technic as Dr. Bunting expresses it, is just what I wish seriously and emphatically to protest against. Considering the wide variation of conditions to be met with in the average practice we cannot hope to find a method applicable in every case. We need, above all things, a differential diagnosis—a classification of objective symptoms which will enable us to decide on the safest method of procedure in each individual case. But we seem to have failed even to apply the knowledge that we already possess in relation to this subject.

During the period of youth and adolescence we know that the horns of the pulp approach very close to the dento-enamel junctions. To remove the enamel, or to cut an inlay in a tooth under

Figure 15.

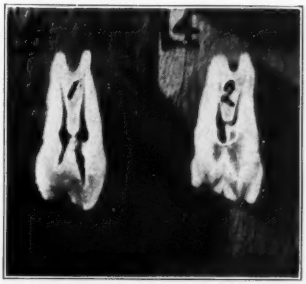
Showing two canals in mesobuccal root of upper first molar.

Figure 16.

Showing two canals in the mesobuccal root of the upper first molar.

these conditions is sure to result in the death of the pulp, even if the resultant pain would allow of such an operation.

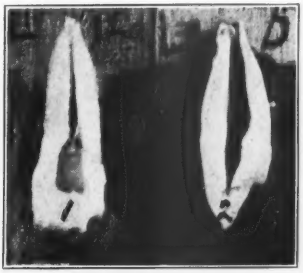
Figure 17.



No. 1 the appearance of the tooth unworn cusps and etched gum line two mm from the gingival and evidences that it was a young tooth and the horns of the pulp extend almost to the dento-enamel junction. Crowning a vital tooth in this case would not be indicated. No. 2 from a patient past middle life. Note the worn cusps, and signs of erosion. To crown this tooth without first devitalizing the pulp would be perfectly safe.

posing the cementum, we can expect a very small pulp chamber and consequently a lessened sensitivity of the

Figure 18.



No. 1, entire pulp chamber filled with dentine. A porcelain jacket crown could be placed on this tooth with safety. No. 2; in this case it would not be a safe procedure. On the other hand, owing to the large apical foramen I doubt if a root filling could be successfully placed.

Figure 19.

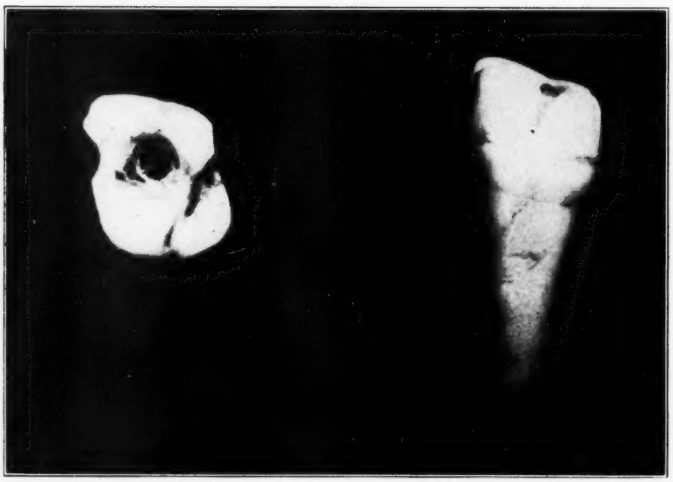
Radiograph that was made for the purpose of determining the position of the vital pulp.

On the other hand, after middle life, especially where there has been much abrasion of the occlusal surface or a recession of the gum to the extent of exdentine. Figures 17 and 18 show both of these extremes. Radiography is of assistance in aiding us to decide on the size of the pulp chamber. Figure 19

Figure 20.

Showing mesial and distal preparation for three-quarter veneer crown suggested as an abutment attachment in bridge work, especially indicated on a comparatively sound tooth and where little or no recession of the pulp has taken place.

Figure 21.



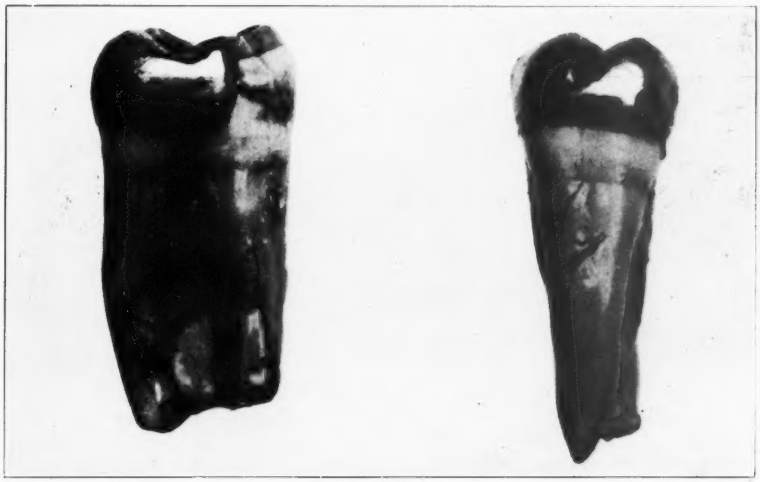
Occlusal and lingual surface shows deepening of central fossa and disto lingual groove for anchorage.

shows radiograph that was made for the purpose of determining what type of attachment would be best to employ.

I believe the dental profession will approve of a more conservative application of crown work. With that object in view every teacher ought to adopt the slogan that crowning should be the operation of last resort, and that to crown a tooth that might be restored to sulcus and the lingual groove were deepened for anchorage (Figures 20, 21 and 21 A). Figure 22 shows the preparation for a similar crown on the first lower molar. Owing to the extreme thinness of the wax model it is necessary to employ the indirect method and the Wienstein Ora E. Casting Metal.

There can be no question of the advisability of removing pulps where there

Figure 21 A.



Shows distal and lingual view of the three-quarter veneer attachment on the tooth.

usefulness by some operative procedure is not only bad practice but malpractice. If this principle were adopted generally, only those teeth where more or less pulp recession had taken place would need to be considered.

In those instances where a comparatively sound tooth was to be utilized as an abutment in bridge work, a three-fourths veneer crown may be employed that does not require the complete removal of the enamel. In fact in these cases of an upper first molar, the enamel was cut thru at two points only; the is a probability of their becoming diseased after crowning; and even tho we meet with the physical obstructions shown above which would prevent thoro treatment, we will have done the best thing under the circumstances—*for we will have chosen the lesser of two evils.*

V.

The necessary limitations of time and space in a paper like this have permitted me no more than a suggestion of a few of the various problems that teachers of crown and bridge work should

have special opportunities of working out to a solution.

One other matter I wish to speak of before I close. I wonder if the time allotted to the various branches of restorative dentistry could not be more equitably divided. Basing my judgment on conservative estimates gathered from almost every section of the United States, I would appraise the crown and bridge work at from 20% to 30% of the routine practice of the average dentist. It would seem that the significance of this fact has not been fully appreciated. A comparison of the hours required by the National Educational Council for Class A Schools shows an allotment of 1300 hours for operative and clinical dentistry, 384 hours for prosthetic technic, and only 320 hours for crown and bridge work. This is only about 16%. The minimum number of hours demanded by the University of the great Empire State of New York for examination are:

For Operative Technic, Lectures and Practice, 990 hours.

Prosthetic and Orthodontia Technic, Lectures and Practice, 1010 hours.

Crown and Bridge Work, Lectures, Technic and Practice, 145 hours.

This allows just over 7% of the time to crown and bridge work.

It is fair to assume that the men responsible for making these requirements had tried to inform themselves, but I cannot refrain from expressing the opinion that they have been very poorly advised. At the same time this situation serves as an additional proof of the fact that crown and bridge work occupies a secondary position in the dental curriculum, a fact which seems to me inconsistent and not commensurate with the important position it occupies in clinical practice. Under the circumstances, the wonder is not that teachers do not obtain better results, but that they obtain any results at all.

Permit me to repeat, as a means of estimating the value of the time given, that we do not learn mechanical procedures by hearing how they are done. The lecture is regarded as the least valuable of all the methods of imparting knowledge, since habits are not acquired in this way.

To a questionnaire sent to all the

Figure 22.

No. 1.

No. 2.

No. 3.

No. 1 shows a distal view of the amalgam model of first lower molar prepared to receive the quarter veneer used as the distal abutment for a lower bridge. No. 2 shows the three-quarter veneer. No. 3 shows the three-quarter veneer after being swedged to the model.

Dental Colleges in the United States and Canada, nineteen replies have been received to date. One of the questions asked was: "How many teachers in your college, if any, are teachers of crown and bridge work exclusively?" Ten colleges acknowledged that they had no one teaching crown and bridge work exclusively. Five colleges claim to have one man teaching crown and bridge work only, while four colleges claimed to have two teachers devoting their time to crown and bridge work. It is only fair to state that all the colleges explained the situation by saying that the subject of crown and bridge work was also being taught by teachers who were engaged in teaching some other subject, usually prosthetic dentistry.

Now let us assume as a conservative estimate that the average college has fifty students in the Junior and Senior class. How much personal supervision can be expected from the one or even two teachers in crown and bridge work in the 320 hours allotted by the National Council? Let me suggest that you answer this question by reminding yourself of your own student days.

I thoroly disapprove of the custom of merging two great departments of dentistry, like crown and bridge work and prosthetic dentistry, under one head. The only advantage I can see is a pecuniary one, and in this case economy is practiced at the expense of the effectiveness of the learning process. Much better results will be obtained if each man is permitted to intensify his efforts in one single direction. I believe the dental profession realizes this, and it is to be hoped that the "powers that be" will soon adapt themselves to the situation.

Within the past few years so revolutionary a change has taken place in our appreciation of the essential requirements of the crown and bridge art that it has become necessary not only to intensify our teaching, but to modify profoundly our theory of its principles and practice. The insight which the investigations of Rosenow, together with the no less permanent work of Hartzell and Henrici, have given us with respect to systemic infection as the direct result of local foci in and about the mouth, has compelled us to remodel our historical ideas and is slowly, very slowly, widening and consolidating our standards of procedure. This slowness, however, ought not to dishearten us. Let me quote Karl Pearson: "One of the strongest factors of social stability is the inertness, nay, rather the active hostility with which human societies receive new ideas. It is the crucible in which the dross is separated from the genuine metal and which saves the body social from a succession of unprofitable and possibly injurious variations. That the reformer should also often be the martyr is perhaps a not over-great price to pay for the caution with which society as a whole must move."

Discussion.

Dr. Jas. Kendall Burgess, New York.

I do not believe that any of us want a lengthy discussion at this late hour on this kind of an afternoon.

I have had a most delightful afternoon myself. I have heard the papers from the beginning, and I have had a great deal of pleasure and derived a great deal of instruction in hearing them. My attempt to comment on Dr. Orton's paper reminds me of a little story of the mother and daughter who attended prayer meeting. The mother when called on for testimony, gave it in true old fashioned prayer meeting style. The daughter, who was thoroly in sympathy with her ideas, when urged to give some expression, got up and said. "I feel just like mother feels," and sat down. I don't know but that this would be a pretty good place for me to sit

down. I feel exactly as Dr. Orton feels about this whole subject, only I have not worked it out in detail and given expression to it as he has done.

There is no doubt in the world about the weakness and inadequacy of our system of teaching. I suppose in a measure it is forced on us by circumstances not easily controlled. They must needs have some money to run the colleges, and some of them feel the need of having a little left over at the end of the season, and that they cannot afford therefore to spend all their income on teachers. That, however, does not alter the underlying principle, the fact that students do not get sufficient instruction to make them finished crown and bridge operators when they go out into the world and take up the burdens and responsibilities of that side of the profession.

The same thing is true in our meetings of the dental societies. I have been asked to give a clinic here and there, and I have noticed just exactly that thing. The men who are interested will cling on and ask questions and want to see the models. If you read a paper they will write and ask for the most detailed information. I published a paper on some little things in technic and thought I made it elaborate enough so that any one could understand it, but a considerable number of men, after carefully reading it and desiring to branch out and take up what was to them a new idea, wrote and telephoned and wanted the most minute directions as to the exact size and shape of the stones and instruments to be used in each particular part of the cavity, and similar minute directions for every part of the work. There was a great desire to do the thing, but a great hesitancy about going into it without the most complete knowledge of every branch of the subject. You cannot, in an ordinary clinic in a dental society meeting, give such a man the detailed information that he wants and that will enable him to go back home and do the thing you are trying to teach. The best way in the world to learn a thing is to do it yourself. But the best way to learn to do it is to see somebody else do it. And that is what the clinician undertakes to do, to show the work and give as much information as he can in reference to it, so that a man who desires to take it up may be able to follow out these methods.

I was at the Pennsylvania State meeting this year. They had a progressive clinic and on two afternoons I gave 12 clinics. There were other men giving clinics at the same time, and in common with those other men, I had 12 separate and distinct classes before me. Each class occupied about 25 minutes. A man has to be a much more accurate thinker and a keener observer, more of a blotting paper for absorbing ideas than I am to get everything out of such a clinic in 25 minutes. I have no suggestions to offer for the remedying of the situation, but it is certainly discouraging that we cannot give out these ideas in a way that they can be more completely absorbed.

I can illustrate my experience with a little occurrence which came up in my practice. At a church dinner one night, I heard a little Irish story which I enjoyed very much. In talking the next day with a patient, a lady of uncertain age, I told her the story and she laughed so heartily that I had to stop work for the moment. She said, "That is the funniest story I ever heard; you must tell it to me again, because I want to tell it to a friend." So I told it to her the second time, and she laughed more heartily than before. "Now," she said, "I have the last part of it but you will have to tell it to me once more, because

I can't remember the first part." So I told it to her the third time. She went away laughing heartily over the story, and intending to tell it to her friend. The next time I saw her she said, "I want you to tell me that story again." "It's the funniest story I ever heard, but I can't remember how it begins, to save my life." And so I had to tell it to her twice more, making five times in all. I don't know what she told her friend but I had to tell her the story five times before she felt sufficient confidence in herself to undertake to repeat it.

That illustrates the matter under discussion. You go to a dental society meeting, you have your models and appliances and you give such a talk, make such explanations and do such work as the time allowed you will admit of, and when you are thru your auditors who are sufficiently interested will come back, and they will say, "Tell me exactly what thickness of metal was used and exactly what size wire, and what number of bur or drill or stone did you use to make that opening with?" and insist on knowing each step in your technic to the minutest detail.

There is just one difficulty about the whole procedure, and that is at this point: The audience, instead of trying to absorb and apply the principles which underlie every operation are trying to absorb all the details of the technic, which is not only a difficult thing but an unnecessary thing to do. There is an eternal conflict between principles and technic. You cannot standardize technic any more than you can standardize dispositions and temperaments and opportunities and technic, as I have said in another place, is an expression of temperament and disposition and opportunity.

You have heard the story of the great artist who when a rival had cut three of the strings of his violin was able to play on the fourth string. That was because he understood the principles of his art. So should we go beyond technic and discover the principles involved in our undertakings. When we have done this, technic will take care of itself.

I read Dr. Orton's paper hastily before lunch and in discussing it with him I said, "You and I are in New York; here is a dental convention to be held in Chicago on the 5th of August, and we both want to get there. The underlying thing that concerns us is to get to Chicago to that convention. But I have a reason for going on the Pennsylvania railroad; you, perhaps, would prefer to go over the New York Central. I have two friends who came here by automobile. That is technic. Coming by the New York Central or by the Pennsylvania or by automobile or by air-plane, if we have one, are simply variations of technic. They are simply different ways of obtaining the same result. But getting to Chicago by whatever means or whatever route we may choose is the main thing that concerns us. That represents principle."

Now, you would not stop and say, "I cannot get a Pennsylvania railroad train at the time I want it, so I will not go to Chicago, when there are the Erie, the Lackawanna, the New York Central, the automobile, and all these other means of getting there." That is the difference between principle and technic; and I think that where many of us fail is because we get the idea of technic in our minds, and say to ourselves: "If I don't get every detail of that man's technic I can't perform that operation."

I do not say to myself any longer, "Whose method or what system shall I use?" For my own practice I have standardized this much of restoration: I have said before: every tooth forms an integral part of the human organism, and as such we must deal with it on the

basis of surgery. Every tooth in its capacity as part of a mechanical apparatus must be dealt with as an engineering problem.

The potential value of every tooth as an esthetic factor, necessitates our care of it from an artistic point of view.

Last of all comes workmanship, because you can spoil all your surgery and engineering and art by poor execution.

And so when I have a piece of construction to do I say to myself, "What is the best surgical procedure for this case? What can I get out of it for the patient as the best net result from a surgical point of view?" Then I ask, "What is the best engineering procedure in this case?" I want to select my foundation with a view to giving the patient the greatest degree of efficiency that the restoration can give, and I want so to prepare these teeth and make such attachment for these abutments as that they will hold securely under the stress of mastication that is going to be produced in that particular mouth. Then given these two necessary things—good surgery and good engineering, I try to procure or retain the highest degree of artistic excellence possible under the circumstances that obtain in the particular case in hand. The workmanship in every case, of course, is what we make it. We have then these four basic principles: surgery, engineering, art and workmanship.

If you have other basic principles on which to build your work, put them into practice and base your technic on them. But we make a mistake in trying to follow out this man's system and some other man's technic and ideas instead of getting the foundation principles into our own minds. If we will learn this lesson, I think it will be of great value to us. So that when we attend a clinic, if we use our powers of observation to discover the underlying principles involved instead of trying to memorize every detail of technic, I think we will carry a great deal more of value away with us.

A REVIEW OF THE CLINICAL DATA RELATIVE TO EFFICIENCY OF VARIOUS ROOT FILLING METHODS.

(Evidence, Not Opinions to be Submitted.)

By Clarence J. Grieves, D. D. S., Baltimore, Md.

(Read before the National Dental Association at Its Twenty-Second Annual Session, Chicago, Ill., August 5-9, 1918.)

THE word "clinical" must be construed, according to the Century (0) definition of "Clinician" as pertaining to "a practical physician whose methods are based on experience, rather than theory." Dorland (91) defines a clinic as "a class of students assembled to witness the examination and treatment of patients." According to Barker, (1) recent progress of clinical medicine depends upon careful control of clinical studies, by means of pathological anatomy and histology and its present development is influenced by pathological physiology, which he defines as a physical, chemical and biological study of disease during life. A correct clinical diagnosis (1) is one where all data, from both bedside and laboratory, is analyzed and the facts obtained are synthetized by experience to compose a definite clinical picture. Dental clinical data, therefore, is that gained at the chair in practice, plus all known laboratory methods. It is such practical experience as contrasted with theory: practical in this sense not being empiricism, tho empirical methods are unfortunately still necessary, because all things are yet unknown. Empiricism, when successful, is efficient without knowing "why;" science, always elusive, constitutes the "why" and so-called practical methods produce permanent results only when based on pure science. We are told that only "evidence," not "opinions," is to be submitted. If all the evidence were dependable and in hand this seminar would not be necessary. An "opinion" (0) is a "belief held as the result of inference and not of direct perception," so clinical opinions of many men will be presented in grouping, by number rather than by name: thus personality is avoided, as it is not desirable to write, or consume time, with an entire dental directory; portions of which are appended as a bibliography.

Based partly in evidence, partly in experience, this is a digest of opinion of such authorities who have honestly tried to think and work along scientific lines, accessible in the short time allotted and many, to whom we apologize, may have been overlooked. It must never be forgotten, if the purely clinical at times is criticized as unscientific by ultra-laboratory men; the clinician may also have a basal laboratory knowledge, which may influence his opinion of laboratory data: its deductions, relevancy, and how it is obtained, for in the final equation clinicians face the patient, applying and checking up all laboratory experience. There could be no better augury for a prompt and sane solution of this vexed subject than the outstanding literary fact that leading authorities are not stubbornly opinionated. On the contrary, minds and methods are changed so frequently as to make any review by quotation most difficult; obviously, sali-

ent facts only must be oriented; before this can be accomplished *individually, we must mentally clarify diagnostic methods* if a real literature, with more sequence than a newspaper, is to be created. This can be done only by daily practice in writing individual case histories along the following lines, paraphrased from Barker: (1)

(a) Anamnesis—History as given by patient.

(b) Status Praesans—Objective examination by dentist with the aid of all physical, chemical and biological methods. *Tentative Diagnosis.*

(c) Catamnesis—Subsequent history of patient, notes on course of disease, kind of treatment and results thereof.

(d) Epicrisis—Dentist's final judgment upon case with discussion of findings; especially valuable for science when clinical history has been controlled by surgical operation or, in case of death, by autopsy. *Diagnosis confirmed or corrected.*

Data submitted is arranged as near sequence as possible, under headings (a) Anatomy and Patho-histology of Operative Field, (b) Diagnosis of Pulp Disease, (c) Diagnosis of Periapical Disease, (d) Methods of Pulp Removal, (e) Methods of Root Canal Filling, and (f) Comparative Curative Efficiency of all Methods.

Anatomy and Patho-Histology of Operative Field.

All anatomists (53) (3) (4) (6) (9) and histologists (2) (13) (18) agree that the alveolus, peridental membrane and cementum in the order named are clinically most important, (82) (76) constituting the reparable attaching tooth tissues (2) (37) (17). To this we would add the maxillary and mandibular spongiosum, in which correct surgery and therapeutics make repair possible. (19) (32) (78) They are therefore very necessary to this consideration. Histologists (2) (6) (3) also state that normal cemental lamellae are deposited according to age and use and are thickened and renewed under stress; a few claiming (2) (6) (61) even in controlled infection. We may assume that apical cementum, if not devitalized by chemicals in sterilization or pulp extirpation; if not infected by long exposure to pulpal or salivary infection, or by dirty dental methods; if not surrounded and denuded by infected granulations, granulomata, etc., or diseased sclerosis: in a word, if the apex be left vital (2) (22) (32) (82) (85), repair is possible and has been proven. This is true in reverse, any of these conditions producing a necrotic or septic apex, always questionable.

Sections cut at varying ages, from twenty to forty, show progressive increase in number of lamellae (2) (6). To this must be added stress as controlled by occlusion in which occlusal facets always should be studied: or any abnormal condition, as gingival lesions, (92) damaging support in gingival and middle thirds producing apical hyper- or hypoplasia (37). *Age, plus* (2) *use and gingival damage are thus important factors and notes of such should accompany all radiographs and clinical case histories.* Emphasis is placed on apical development, (18) vessels, (8) (9) and foramina; practically confirmed by the universal warning from all operators as to risk in treating and filling the apex of adolescence; existing as one (2) (4) (9) (8) (18) trumpet shaped dentin opening, lined by one or two cemental lamina, containing both dental pulp and vessels. These vessels, gradually enmeshed from youth to middle life by accruing cemental lamina, create the main and multiple foramina. Additional lamellae form the *normal rounded or pointed adult apex, which we note is all cementum.* (2) (4) (6) (8) (23) This is essential in reading radiographs, especially of encapsulation; for in normal apices there exists no cup shaped foraminal opening in which encapsula-

tion can lie or radiographically appear; it therefore extends into peridental membrane or beyond. (82) (55) Childhood excepted, such foraminal concavities are caused by disease, (23) (32) indicating cemental absorption and in these areas the gutta percha lies. (78) Multiple foramina, (9) anatomists agree, occur in sixty-five to forty per cent (8) (18) (82) in all apices, two authorities quoted as follows:

Sup. 1st (65) (48) and 2nd molars	90%
Inf. 1st and 2nd molars	75%
Sup. Bicuspids	75%
Sup. Cuspids	75%
Group, average of	78%
Sup. 1st (31) (32) (59) and 2nd molars	95%
Inf. 1st and 2nd molars	80%
Sup. Bicuspids	70%
Sup. Cuspids	35%
Group average of	70%

Multiple foramina appear in other teeth, one authority claiming more (48) than one in every tooth. Such foramina cannot be explored in *situ*: few operators are bold enough to claim location by apexograph and radiograph in the mouth and they are rarely radiographically visible in extracted teeth. Chlorapercha discloses them in but two per cent. of perfectly filled apices, not because absent but because they are rarely opened. Histologists, (6) (2) (5) and pathologists (37) (17) (22) state that normally, after age forty or earlier; under occlusal stress or gingival damage in sound teeth, there is a progressive closure by normal, sometimes hyperplastic cementification, of many accessory, sometimes the main foramina; limiting pulp vascularity, associated frequently with pulp degeneration. (12) (14) (13) (78)

Disregarding irregular third molar groups; percentages of root and apical deflection, curved and recurved, are about the same, involving the same groups as for multiple foramina. Comparative anatomists (4) (5) (3) associate short, comparatively simple straight roots, little apical curvature and few foramina, with *large crowns* of little contour, cusp elaboration and duplication; while long, often curved and complicated roots and multiple foramina are associated with *short crowns* much contoured, deep cusping and cusp definition, true also of anterior teeth with well cingules. This generalization is not accurate, but helpful in absence of radiographs. The great importance of an intimate histologic knowledge of the peridental membrane is emphasized; (78) (76) (52) (31) its vascularity, as related to dental pulp and alveolus, the intricacy of attaching fibres marking it as a special organ. When an entire segment of such functioning fibres is lost, they are never restored, (2) repair being ordinary fibrous tissue. When only destroyed in part the regenerative cell elements, (37) particularly fibroblasts, rebuild new fibres and are said to be specialized into cementoblasts, inducing repair and reattaching the apex, possible: only if the membrane is not saturated with strong chemicals or destroyed by cauterization (2) (31) (60) (82) or sepsis. The error of the so-called "apical space" is noted, now recognized anatomically as misleading as the single foramen idea. Comparative thickness and density of the membrane must be studied, as shown by radiographs, (94) bounded by root and lamina dura; thick in youth, (2) (6) thinner in middle life and very thin, with loss of elasticity, in old age. Middle third and apical variations in thickness, as indicated by comparative radiographs, should be watched (94) (69) as resulting from disease—periodontitis (proliferating) or under occlusal stress, (absorption) (78) (23) particularly under crowns and bridges; the membrane as a widening line or fused and radiopaque, the latter indicating repair, which may be infected.

Recent investigations (19) (18) of the vascularity, arterial, venous and particu-

larly lymphatic of maxillary and mandibular spongiosum show minute vessels accompanied by perivascular lymph channels, extending from sub-apical regions where they are quite numerous, directly up thru and around each alveolar partition and peridental membrane to the very tips of the interseptal crests, freely anastomosing with neighboring vessels, as well as those of the peridental membrane: forming a basket network of vascularity plus lymph; completely, underlying and surrounding the lamina dura of each root (8). The lymphatics (61) emphasize again the grave danger (26) of slow septic (78) absorption, particularly if lamina and peridental fibres be sufficiently damaged to allow tooth sag under bite stress. The relation, extent, density and interstitial growth at various ages of trabeculae, cancellations, character and amount of the medullary connections must be reviewed in its radiographic relation, as these tissues are under survey in every working (94) (30) (56) hour. They must be intelligently compared with normal bone areas in the same patient. Many extravagant claims of bone infection which did not exist; or recovery, when granulations or infected sclerosis still persist, will thus be readjusted and correctly reported. Next in clinical interest stands the dense cortical bone, lining each alveolar socket, known as the lamina dura (3) or stratum durum: showing as hard bone in good radiographs, forming the osseous boundary of peridental membrane, giving insertion to osteal ends of peridental fibres, defining membrane width according to age, use or disease, uniting with its neighbor, it forms the circumferential and interseptal alveolar crests supported by a medullary and trabecular scaffolding: the normality of which must be understood in radiographic interpretation.

Any variation in density (94) of the lamina, which is our greatest diagnostic landmark, (78) places the tooth which it retains under suspicion; as it is only absorbed under great stress or infection (23) and is as frequently repaired and as important as the cementum, much of which is radiographically visible. The variation in mental foraminal relation of inferior bicuspid apices and incisive foramina to superior central apices should be more fully elaborated; (23) for they are mistaken as abnormal rarefactions, particularly when approaching filled apices, as are normal eruptive (78) tooth crypts of inferior molars when in infra occlusion, apically: appearing near the mandibular canal, the superior boundary of which is often indeterminate. Recent work has shown the superior maxillary sinuses in development progressively follow down the apices of first molars and bicuspids, often even canines, second and third molars in eruption, so age is a factor. Normally bicuspids and first molars often appear in the antral floor and occasionally the floor is lacking and apices are covered by nothing but antral submucosa. These facts are important in reading radiographs and in intentional apical (82) perforation and filling protrusion; unorganized granulations and granulomata often grow into the sinus from such apices, which may lie in small bone necrosis, and purulence finds (78) there exist in the line of least resistance, all involving the sinus. Laryngologists accent great variation in size and extent of the antra in the same individual; (95) all such facts have a definite operative relation and are none too plain radiographically where, however, continuity of the lamina covering the apex in sinuses, except as noted according to authorities quoted, is the only guide.

An accurate conception of *patho-histology of dentin and dental pulp* is needful before canal treatment can be efficient. Your attention is called to the loose (2) (12) (14) unorganized arrangement of all pulp cells, which are apparently functionless except the external layer of odontoblasts; the pulp appears as an indefinite mass of embryonal

connective tissue, walled off by dense dentin, constituting an internal organ, symptomatically. (14) Vascularity (2)(93) is relatively great, associated with loss of all vessel coats except the endothelial, appreciably increasing risk of hyperemia or stasis. The pulp is thus as an end organ, predisposed to calcific and fibroid degeneration, (13) peculiarly and rapidly damaged by hyperemic states: hardly appreciable in other tissues and sadly lacking in resistance to infection. (77) A recently proven lymph supply (61) corrects the older idea and proves this organ not so isolated but what toxic products and medicaments may reach the systemic circulation, producing disease. Several authorities accent dentinal vitality (14) (15) (78) as demonstrated in dentinal fibrils, tubules and linings, confirming the idea of repair and resistance to infection by hyaline or tubular calcification; most important in this connection. Histologists and clinicians are evenly divided on the question of *pulp function.* After ages of thirty-five to forty one group, the *"degenerationists,"* (13) (53) believe that all normal reparative and formative pulp function ceases and various degenerative changes (calcific, fibroid, gangrenous, etc., primarily without infection, which may arise secondarily) insidiously begin in pulps of normal teeth. They also state that at about the same age and in the same percentage of normal teeth, the apical cementum becomes hyperplastic, (92) (11) (12) closing many accessory and occasionally the main foramina, until pulp nutrition is doubtful, and that both of these conditions may be associated as cause and effect. This group, (13) (53) therefore, suggests pulp removal before canal lumen are blocked by calcic deposits or periodontitis established by the toxic chemical, (not necessarily infective) products of pulp degeneration; one authority adopting as his slogan, "Remove the Pulp Before it Becomes diseased." (53)

The inconsistency of this practice must be noted. In one breath it announces the pulp as a formative organ until age thirty-five, after which time degeneration begins and in the next, we are told it should be removed before this degeneration sets in. Patho-histology knows no, even partially organized, tissue which degenerates as soon as formed. Such operators should at once proceed to the ultimate and remove adolescent pulps, when canal lumen is large and a single bell-mouthed foramen makes perforation unnecessary and chlora percha protrusion and encapsulation easy. If these practices are correct this is quite the time and place to apply them: on the contrary, by unanimous consent it seems agreed that these are the really difficult canals to medicate and fill; many going so far as to practice pulp capping (84) awaiting apical development. To be brief, this group fear the results of pulp degeneration, producing periapical disease by tissue putrefaction, more than they fear infection and doubt their ability to fill such apices without infection. If, with these theories for pulp removal, our friends would only furnish a working set of pulp symptoms for accurate diagnosis of calcific, fibroid and gangrenous degeneration as soon as they occur, it would be helpful; for we know of a few but pain, except those arising in the membrane, which are *periapical not pulpal;* and when these do appear *it is too late and periapical lesions exist.* The other group, the *"vitalists,"* (30) (39) (42) (68) generally sustained by patholgists, (52) (60) (31) (23) insist that if not involved by caries or infection the pulp should not be disturbed, (71) even to gain (36) seventy per cent occlusal efficiency of good bridges; that its function is incomplete until the tooth is lost, that in some stages of pyorrhea where pulp degeneration occurs, periapical disease is rare and indifferent canal operations, not reaching the apex, are often efficient because foramina have been almost closed, *not by the dentist* (78) but *by apical hyperplasia induced by disease.* They

also claim "it questionable (38) procedure to interfere with the pulp before the age of thirty-five and state the impossibility of good canal work until apex is well rounded," and, that as age advances, carious vulnerability decreases and the apical cementum increases during this period. This will partially obliterate multiple foramina in forty to sixty-five per cent of all apices and greatly simplify canal operations. This disagreement recalls the discussion of "Conservation of Dental Pulp" which, years ago, raged thru dental literature. Both groups may eventually be proven extremists and later, this may be classed with the fad of pulp removal to cure pyorrhea. That large masses of metal in fillings or crowns approaching the pulp produce degeneration, which may be complicated by infection because of previous dentinal exposure, is well known. (10) In such cases the "degenerationists" may be right, but *routine pulp removal in sound teeth subject to pulp calcification, pyorrhea, or old age, unless prompted by pain or infection, is radical procedure;* a majority agreeing it might induce more periapical disease than it prevents.

In this connection a statistical radiographic report (90) of 1434 crowned teeth (root filling not attempted) is interesting. It shows twenty-six per cent periapically infected as against seventy-four per cent not so diseased; as crowns (shell crowns illustrated) mask, radiographically, signs of operative interference and dentinal partitions near coronal pulp it is difficult to determine what percentage were mummified or filled with radiolucent substances. Figures are sometimes misleading. The fact remains that but one-third of such teeth were periapically diseased and in the same proportion, same report, one-third of perfectly filled roots, (25 per cent infected, 75 per cent not infected) were also periapically infected: so crowning of vital teeth, plus pulp degeneration, may cause no more periapical disease than perfect root filling. Add to this that out of all roots filled, (1064 teeth) same report, only two per cent were perfectly done; *while other factors enter this question,* we should think twice before invading the dental pulp. *Sane and safe practice, all literature considered, would be removal of the pulp, surgically and promptly, only when infection threatens the apex and attaching tissues, or when absolutely necessary as a last resort to construct such occlusal bridge restorations as cannot be otherwise accomplished*: always considering general nutrition and the seventy per cent occlusal efficiency of bridges and thirty per cent of dentures; and the fact that bridges increase bite stress on abutments, the apices of which *must not* be involved in periapical lesions. Brief reference to *recent theories, causative of dental caries,* is necessary in pulp diagnosis. *One school teaches,* (27) (28) whatever the pathogenic character of micro-organic oral surface content, in its depths carious detritus contains only acidophilic types: (Moro-Tissier group) that pathogenic forms, streptococcus for instance, are inactive or do not appear: that dentin must be decalcified to be pathogenically infected; saying, "it is impossible (13) to infectively invade dentin tubules without decalcification while the pulp remains alive." The practice of vital cavity preparation, isolated from mouth infection by rubber dam, etc., with no attempt to sterilize dentin and immediate filling emplacement, is based on this theory: that because vital dentin is dense it is sterile. They also state that "the tubular contents of dentin would be less attractive (13) to infective forms after pulps are destroyed;" assuming that hard devital dentin is also not infected. *Query, When is dentin really infected?* If impossible with both vital and devital pulps as stated, *the only time dentin is infected, according to this theory, is when it is decalcified or carious.* (Further elaborated in Seminar by Dr. Collins.) *The other school (26) teaches,*

while many non-pathogenic bacillary forms are active carious agents; streptococcus and other pathogenic types are symbiotically present, appearing and culturable, not only from carious detritus but from hard dentin, (78) exactly as from the muco-periosteum or propria in other oral tissues: some claiming the streptococcus as ever present and the predominant factor in dental caries. Certain bacteriologists announce isolation of diplococcal streptococcus from pulps of sound (24) (25) teeth, claiming a percentage of pulp infection is not only produced by hematogenous convey, but is also selective. This statement *only appears* to be confirmed by non-carious teeth, sound by every test, pulps devital by trauma, the tissue of which is notably infected. It also can be classed with claims of hematogenous periapical infection and should always be in mind, but not allowed to divert methods which rightly are aimed at local infective portals. (16) Authentic radiographic and cultural reports of teeth prior to so-called "age of degeneration" exist, proving pulp infection may occur under solid and sensitive dentin; pulp both sensitive and hemorrhagic and apparently vital with apical granuloma; it thus appears that a percentage (78) of pulpitis is infectious prior to actual exposure. Pending settlement of this discussion every effort should be made to sterilize all exposed dentinal surfaces, vital and devital. It is obvious that *present methods of pulp diagnosis are unscientific and unsatisfactory.* That correct diagnostic pulp methods will solve the problem of periapical disease is the personal opinion of the author. Our authorities furnish a pulp pathology which is rather complete: classified as hyperemia, active and passive, pulpal infarct and abscesses, gangrene and putrescence; these phases have laboratory verification, but *there is no associated set of definite symptoms indicating and differentiating such conditions.* Relative response to thermal change, dentin sensation, indefinite electric tests, etc., appear to be our all, symptomatically, as indicated by the pulp. When sepsis passes out the apex, *from pulp to peridental membrane, the damage we would avert has been done and an outspoken group of symptoms present; comparable to those induced by pulp degeneration, but these are periapical not pulpal;* well illustrated by voluminous literature, *where the treatment, pulp removal, antedates and is the pulp diagnosis,* and odontalgic or referred pain is apparently the only pulp factor. An attempt will be made to select out of this literary "confusion worse confounded" on authority of clinicians, operators, pathologists and histologists, (79) (8) (84) (86) (30) (39) (29) (44) (50) (54) (55) (58) (89) (74) (41) (31) (64) a practical working classification in three groups as follows: (a) *The Sound Tooth—vital pulp*—may be slightly carious, contains a healthy pulp and vital apex, supported by normal attaching tissue. *No pulp nor periapical symptoms.* (b) *The Carious Tooth-infected pulp*—pulp involved by caries or degeneration; dentin and pulp both infected but products of degeneration (chemical), or infection (bacterial), have not passed beyond nor involved the apex, which is vital, nor produced periapical disease. *All pulp and no periapical symptoms.* (c) *The Infected Tooth—septic pulp*—dentin and apex saturated with sepsis and devital; pulpal abscesses, gangrene and putrescence; putrefactive and infective products of which progress beyond foramina, producing proliferating periodontitis, granulomata, unorganized granulations, cysts, etc., or exudative purulence, pus, serous and fibrinous, etc., in other words "blind" and "fistulous" alveolar abscess. *Few pulp and many periapical symptoms.*

This classification is admittedly both broad and weak, but it is basic, founded not on theory but actual methods of treatment which vary, according to type.

It will be used for reference until a better is suggested.

DIAGNOSIS OF PERIAPICAL DISEASE.

Unlike pulp disease, all quoted agree that in periapical lesions many diagnostic factors are available, (29) (39) (42) (54) (70) (23) (7) (76) depending on type of lesion. To *determine extent of pulp vitality* the usual tests should always be made: Appearance; thermal change, cautery, hot gutta percha, ethylchloride, etc; electricity, Faradic and high frequency (doubtful), exploration of canals, etc. To *determine periapical invasion*: The response of attaching tissues to percussion and palpation; reaction of membrane in occlusion, especially on morning awakening or at beginning of a meal; response to systemic infection, as grippe, tonsillitis, "catching cold," etc.; patient's history of pain, temperature, etc.; visual evidences of inflammation and infection as swelling, etc., bulging or perforation of muco-periosteum and alveolar plates, breaking down into chronic liquefaction, sinus or fistula, suppuration, etc., or organizing into granulomata, fibrosis or sclerosis. Considerable doubt exists as to *the systemic reaction and the diagnostic value of blood determinations;* some claiming the differential blood count absolutely diagnostic, (87) others that it is useless; the same, in less degree, is true of complement (26) fixation. (76) Apparently a misunderstanding exists. Such tests can be diagnostic only of definite systemic invasion and are, as yet, doubtful, especially in the minute but daily sepsis of a small chronic granulating nidus. Acute alveolar infections are all too apparent, hence, seriological tests are useful, not to diagnose alveolar abscess, but to determine whether the patient is absorbing toxins systematically or mastering infection. Reports to the contrary, complement fixation studies of oral infection are doubtful, for infected foci in other parts of the body may also be disturbing the seriologic picture and must be ruled out. When they are as dependable as a luetic Wassermann it will be helpful and this question promises much.

Periapical lesions are broadly divided into:

(a) *Granulating types* (23) (26)—proliferating periodontitis, granulomata, unorganized granulations, cysts, etc.: insidious, causing little or no pain, should be explored for pathology specimens by alveolar perforation; by aspiration via canal and alveolus with aerobic and anaerobic cultures; advantage should be taken of the "locked" area, avoiding contamination. Such types are best detected by skilled radiography and unprejudiced interpretation.

(b) *Exudation types*—whether primary or secondary, with pus, serous or fibrinous exudates and associated with open granulations. When fistulating, apparently easy to diagnose as to location and extent; are not so simple as they look; must be explored for pathology specimens, aspirated and cultured, always noting contamination risk from open-mouth areas. Accurate radiographs with many explorers in situ, indicating extent of new sinuses, are necessary. *The radiograph* (30) (42) (56) (94) (76) (78) *taken and developed according to latest technic by those familiar with facial and dental anatomy; in form generally of intra-oral films, sometimes extra-oral plates, stereoscopic on occasion is simply indispensable; the unanimous opinion being that dentists, in this type of work, as well attempt operation without a mouth mirror as without this adjunct.* Radiographs do not show infection nor disease in teeth, facial or mandibular bones and soft parts any more than in other body tissues; they do show by contrasting radiopacity and radiolucence or rarefaction in two dimensions, sometimes perspectively, in all hard and many soft tissues, as no other method will, destructive, constructive and developmental variations, when compared with normal surrounding tissue.

The lamina dura, (78) previously mentioned, is the principle bony landmark in periapical diagnosis. Its continuity as a radiopaque line comparable to dense antral boundaries; provided it appears at normal peridental membrane width, whatever the rarefaction in the medulla, beyond or root operation near it, marks that root as normal. Conversely, authorities agree, (67) (96) (88) apical rarefaction, with incomplete or broken lamina, generally appears on teeth with diseased pulps or apices and never on teeth with vital pulps, except as noted. When rarefaction invades the lamina we may safely conclude, by comparison with adjacent normal lamina and bone areas, that damage results from foramina or apex or that root and may still result therefrom; provided always good radiographs and clinical findings agree. This statement is sanctioned by all conservative authorities quoted and confirmed by post-operative study in patho-bacteriological laboratories, proving disease and infection in these areas. (20) (21) (23) (31) (52) (62) (37) Evidence is now accessible, establishing by modern cultural methods the infective element in areas radiographically suspicious about pulpless teeth; (25) as a check, may be quoted the fact, that cultures are negative about teeth with vital pulps if taken from medulla some distance from infected root. In this connection the interesting development in war bone surgery, where correctly operated bone areas, after three months' repair and radiographically dense; on second operation, break down with great infective loss of tissue; cultural tests proving such repair much infected; so bone repair may be organized and radiographically dense and still harbor infection for some time.

It is recognized (69) (94) that all tissues paralleled are masked, appearing as opaque as the tooth; serious interadicular disturbance thus occurs unobserved in multi-rooted and labially or lingually in single rooted teeth. While authorities quoted in majority recognize radiographic limitations and assert its great value, a few do unintentional harm by criticising radiographs, (51) (73) when their interpretation only is open to criticism; quoting instances of delayed bone repair in major surgery, implying thereby that periapical rarefaction is pathologically doubtful; bone rarefactions may result systemically from osteoporosis, osteomalacia, pregnancy and calcic waste; sequestra occasionally seem more radiopaque than normal bone and *many unusual factors may, but rarely, do appear.* Exceptional cases cannot be compared with the usual and should not be quoted, disturbing confidence of honest operators seeking help: nor can they be used by dishonest operators seeking an excuse. Authorities (69) (94) quoted claim that "ninety per cent of the radiographs taken by modern technic are dependable" and surgeons, pathologists and clinicians agree, from post-operative findings, *that if there be a defect, it is in showing too little rather than too much tissue involved.* No better diagnostic means is at hand; the whole matter hinges on the clinical features plus the operator's attitude in interpretation, *which must never be attempted unless the patient's history and tissues are under direct survey.* (78) If radiographs can be trusted for normal tissue, then they should be trusted to show abnormal tissue details and repair; there is a tendency to condemn a tooth and patient to treatment on sufficient radiographic evidence of infected rarefaction; but long after treatment, the same area, slightly reduced, *is not so accepted,* (79) (29) (54) (64) (80) but it is said to be under repair, just because the canal has been treated. If there be any question of repair, or if the operator is not willing to accept adjacent spongiosum for comparison; cancellations in areas, repaired some time after clean extraction, (78) should be rayed and studied, for there normal, reparative detail, slightly more dense than the spongiosum

appears; this is qualified by occasional granulations persisting, because necessary curettement after extraction was neglected. Bone repair and sclerosis, often infected, may show dense as cortical bone in the medullary midst, *but such repaired areas are never persistently rarefied, nor do they exist as granulation tissue for years after operation.* Normal granulation is comparatively rapid and is soon organized into normal cancellations. This has an important bearing on canal treatment and filling, (89) particularly protrusion (80) (79) (49) (81) and the claim that it always cures these lesions; while just such areas persist years about encapsulations. Radiography answers the surgical question of "How far?" and "How deep?"; showing only in part, fillings approaching the pulp. It differentiates no pulp lesion, but calcification or pulp nodes, nor does it show calcific degeneration in old granulomata or cysts. It is indispensable in root canal opening, (63) defining depth or passage by exploring wires and extent of correct or incorrect apical filling, only when such consists of radiopaque gutta percha (gutta percha and metallic salts), or metals; and it does not show paraffin or chloroform-rosin, unless impregnated with such salts. *Many proprietary pastes used as root fillings, which do not fill and may or may not set, appear as dense fillings;* as Beck's paste, zinc oxide and iodoform, etc. These must not be overlooked in interpretation.

Methods of Pulp Removal.

As this is a discussion of methods not armamentaria, of the application and results of instrumentation, rather than instruments, operative detail is omitted as far as possible. A consideration of pulp removal is necessary, for the canal can not be thoroly filled unless all pulp is removed, *otherwise it is filled by both pulp and filling, a common occurrence.* Pulp removal (77) (58) (50) implies devitalization:—*Chemical,* usually arsenious oxide; *Surgical, local anesthesia,* (a) *pressure*—in pulp chamber, cocaine or novocain, (b) *infiltration*—deep (alveolar) or superficial, muco-periosteum, or (c) *conductive*—by nerve blocking or infiltration of larger nerve trunks. We find, sharply expressed, an aversion to the use of arsenic in *all* dental literature; well founded on fact, that this remedy is a selective connective tissue poison, known to be just as destructive of apical cementum, peridental membrane and bone as of pulp. Especially true, where extra vascular pulp permits rapid absorption, hence *successful devitalization.* Chronic (76) (82) (55) suppurative pulp surfaces, like varicose ulcers, take up arsenic slowly with less risk to apical tissues; but these require many applications and are *distinctly unsuccessful. Therefore, where arsenic is efficient it is doubly dangerous and when not dangerous it is not as efficient.* Much post-operative evidence exists of rarefactions with apical or medullary necrosis, produced by arsenic, even before pulp removal or root filling, some of which may have resulted from arsenic plus infection. *At best, it may be said that arsenic, even when infection is not introduced by the operation, leaves a necrotic apex which in time denudes, constituting a lowered resistance, always open to sepsis.* Those (29) (51) who still recommend its conservative application, only when no other means are available; very rightly suggest short time applications or on vital dentin far from pulp, promoting slow absorption. It is likely the unknown savior of apical tissues where pulps were arsenically saturated, in the past, has been the twenty-four hour rule for its removal; when prompt extraction of the coronal and middle third arsenical pulp tissue, followed by strong coagulants or the iodine group, limited apical absorption and later, surgical removal of apical pulp third, was accomplished, leaving the apex vital. *When arsenical devitalization is necessary this method is conservative.* Pressure anesthesia is good,

and would be better surgery if only the amount of pulp, pathogenically involved, could be determined. Successful pressure (58) anesthesia depends on persistance of pulp vascularity in spite of pulp disease; therein lies the danger, for sepsis is often forced with the anesthetic along the same vascular path out into apical adjacent tissue; producing pronounced lesions unknown to the patient and operator, who are mislead by peridental symptoms; and attribute such to post-operative trauma rather than infection.

Infiltration and conductive (75) (65) (70) (36) (42) anesthesia is admittedly surgically ideal for pulp removal, meeting all operative requirements of asepsis, etc. The important question as to what constitutes complete pulp removal raises the point as to where dental pulp ceases and where vessels supplying it begin, *necessarily a question of age as previously explained.* Some *authorities* (32) (37) imply that adult foramina are tenanted strictly by afferent and efferent pulp vessels, stating that *the pulp* (52) (59) (32) *per se ceases with dentin and is bounded by it and the odontoblasts, and all else beyond, contained, apically, is vessels.* Can all pulp with such dentinal boundaries as the apical limit be removed? Operators (39) (80) in majority say it can never be done by instruments alone, but only when chemico-mechanical methods are used, i. e., sulphuric acid, phenol-sulphonic acid or sodium-potassium, plus instrumentation; histo-pathologists (59) (65) (52) (82) say it can rarely be done even then. If by *dental pulp is meant all soft tissues apically contained,* considering minimum multiple foramina and apical curvature at forty per cent, both of which are often not located, either by radiograph or apexograph, hence the operator only guesses at their number and presence; that it is impossible to find, cleanse and fill all such in extracted teeth, few operators are so boastful as to claim (79) (80) (81) (83) (86) complete removal, even by sodium-potassium. If by clean pulp removal we mean *only dental pulp as defined by dentin,* such operation need not enter nor violate the peridental membrane; thus avoiding trauma, often infected, resulting from intentional (55) (82) (78) (40) perforation which, after all, *if it does not make a false opening, cleanses but one, leaving all others unclean.* Referring to classification, consensus of opinion is in favor of removing pulp, *as defined* by odontoblasts, in *sound teeth,* (40) (41) *vital pulps* and *carious teeth, infected pulps;* an idea existing that remaining vessels will be liquefied or absorbed, by what process not stated but in *infected teeth, septic pulps and periapical disease,* all agree that all soft apical tissues should be removed, which always means perforation. Two (31) (90) statistical statements show thirty-five per cent to fifty per cent imperfectly filled roots with no evidence of infection, thus an average of forty-two per cent poorly filled roots contain soft tissue, which is vital or so controlled or blocked off as to prevent subapical infection. Numberless radiographs exist showing chlorapercha pumped thru one foramen and *it should go into others, if tissues are out,* (78) (82) disclosing multiple foramina in forty per cent. of them. Such is not the case, only two per cent delta apical fillings can be found; further, with multiple foramina at minimum forty per cent, only two per cent of which are filled, then thirty-eight per cent of all perfectly filled apices still retain pulp or vessel debris. In removing fresh pulps, it is said (60) to be impossible to get the odontoblastic layer which clings to dentin. This is very important, if true, for *an ideal root filling enters* (48) *all* (45) *tubuli as well as canal.* In silver (33) deposition, it is stated that no deposit occurs in vital dentin containing fresh fibrils, but only in matrix substance, containing dead fibrils. A most respected (45) (48) investigator always taught two days delay after fresh pulp removal for fibril

liquefication; stating chloroform-rosin could then be forced to a depth of one-half the dentinal radius. Many agree (58) in pulp hemorrhage, after pulp removal, a delay of from two to seven days is necessary before filling, because the tooth gets "sore," ascribed by some (78) to infection introduced by operation, but the majority claim, hemorrhagic cells engorge the peridental membrane and believe delay allows drainage and liquefaction of all cells into aseptic or antiseptic (58) canal dressings. We may now apply our findings to two groups of the pulp classification, i. e., *sound teeth, vital pulps, and carious teeth, infected pulps.* In *sound teeth, vital pulps,* there is some evidence that in the thirty-eight per cent known to contain apical shreds or vessels, which may maintain touch with peridental vascularity, remaining vital or depositing substance, (*only in a vital apex,*) difficult to differentiate, as either cementum or osteo dentin. (82) (55) (2) (84) (18) (37) This should be no excuse for lazy or careless apical methods and is possible only in absence of strong chemicals or infection. (23) (82) (78) (32) In *carious teeth, infected pulps,* the same may be true, but even under aseptic precautions, there is always a doubt of apical sterility, and such shreds might be infected.

Methods of Root Canal Filling.

Materials used in root fillings are not mentioned in this report, only as they modify methods (33) (discussed by Dr. Price in Seminar). *Pulp removal and canal filling is a surgical operation in which medicine has little part, except as a germicidal or antiseptic accessory;* this means asepsis when possible, otherwise antisepsis; implying sterilization of armamentaria by heat or chemicals and operative field by electric medication or chemicals, (amplified in this seminar by Drs. Pond (34) and Hartzell (64). Dental literature uses the words aseptic and antiseptic rather indiscriminately; in aseptic operations no germicides are applied to tissues, introduction of such suggests a doubt of asepsis and, breaking the chain, creates an antiseptic operation. With this understanding the following necessarily faulty classification is adopted. Operators claim, and are so divided, into those who practice:

Group 1—*Absolute asepsis* (39) (30) (81) (83) (50)—ionization and chemical sterilization of operative field in all cases of pulp removal, in all three groups of the classification, which is chemico-mechanical; *aseptic root filling, perforation and encapsulation in all cases.*

Group 2—*Asepsis-Antisepsis* (84) (54) (49) (58) (45)—In pulp removal only of teeth with *vital and infected pulps;* mild medication; chemico-mechanical pulp removal; ionization and chemical sterilization of operative field in teeth with *septic pulps and periapical diseases; aseptic root filling,* perforation and encapsulation only in septic cases.

Group 3—*Antisepsis* (63) (51) (43) (29) chemico-mechanical pulp removal; much chemical sterilization of operative field; instrumentation in midst of germicides in all groups of the classification, teeth with *vital pulps* sometimes excepted; *antiseptic root filling;* no perforation; filling in, but not thru apex.

Group 4—*Antisepsis* (29) (43)—prolonged use of, and dependence upon drugs in pulp removal and canal filling in all groups of the classification; all apices filled with germicidal pastes; some use such only in "inoperable" apices; the operative field is infected and in operation, reinfected; *antiseptic root filling;* no perforation, filling as near apex as possible.

As far as pulp removal is concerned, it is extremely doubtful if group one ever live up to or realize their claims of perfect asepsis. The consensus of opinion favors the methods of groups two or three; and the authorities here quoted rarely practice the method of group four, except as a last resort. It is noted that all groups honestly try to prevent infec-

tion in canal filling. Groups one and two apply aseptic and three and four the antiseptic methods. Generally the idea is to sterilize and keep sterile the operative field during and after pulp removal, varying according to the foregoing pulp classification, operators disagreeing only as to methods. Pathologists agree, local resistance is lowered and traumatic periodontitis is produced in teeth with *vital and infected pulps* (see classification) by apical perforation and is maintained (40) (55) by encapsulations, (22) (29) (32) (39) which lie in the membrane; (78) (82) (50) operators regularly practicing this method are not consistent and balk at gutta percha protrusions in the middle and gingival thirds, when there can be very little difference, and with some chlora percha protrusion is intentional (80) (83): others (86) say it is accidental, it will do no harm, and state all foramina (58) (87) (79) (54) cannot be certainly filled without it. It is not the writers province to discuss possibilities of sterilizing infected dentin, apical cementum and multiple foramina (discussed by Drs. Hartzell and Collins in this seminar) (33) (54) (34) (75) (86) (51) (64) (35), but we all have our own ideas (74) (78) (83). A definite decision of this question is important, because the use of sodium potassium, sulphuric and phenol sulphonic acids in chemico-mechanical canal opening and, sterilization by the use of ionization, formalin preparations, phenol, cresol, etc., in high percentages, ten to forty, is said by *many pathologists* (82) (78) (67) (60) (55) (52) (82) (32) (30) (22) to induce apical necrosis, proliferating periodontitis, granulomata, etc., *even before canal is filled: thus producing the disease in attempting to prevent or cure it. Another class, generally operators,* groups one and two, claim that one or all (43) (44) (46) (47) of these methods is necessary and will sterilize (29) (33) (40) (41) and render innocuous all soft tissues which can be reached in no other (50) way in septic apical regions, and, extending beyond the apex will destroy all extra (54) apical infected granulations and necrotic bone; and produce radiographic evidence of permanent bone repair. *Still another class,* taking a middle ground, attempt by the use of milder germicidal solutions in *sound teeth, vital pulps* and *carious teeth, infected pulps,* (see classification) by ionization occasionally and less drastic chemico-mechanical methods in pulp removal, to sterilize apices (65) (67) (55) (64) (89) and even cure periapical disease. All such that cannot be so treated, they assert should be removed surgically (67) (55) (78) (82) (75) (23) because long treatment of diseased apices is but a waste of time and great risk of patient's health (85) (68) (1) (36) (31) (76).

Comparative Efficiency of all Methods.

"Efficiency" of a root filling method will be interpreted in this report as its power (a) not to induce periapical disease by lowering local resistance, (b) to prevent such disease, and (c) to cure local periapical lesions and general disease resulting therefrom. *In sound teeth with vital, and carious teeth with infected pulps and no periapical disease,* (see classification) *if such can be removed under as aseptic precaution as possible; under careful chemico-mechanical instrumentation, leaving only impossible vessels and vital pulp shreds in immediate foraminal openings of a vital apex; which has not been cauterized or over sterilized; or if these strong agents can be used without passing out into the membrane—tho conservative operators prefer milder means. If all this is accomplished without perforation, avoiding periapical infection from debris, any aseptic-antiseptic canal filling method, which will close these openings well into, but not thru the apex, will insure apices infected as little and filled as much as possible and a functioning tooth. Mate-*

rials: *chloroform-rosin* (89) (45) or chlora percha used with hard gutta percha points, apparently preferable. *Note, that a vital apex is the prime factor, and these methods rarely induce and generally prevent periapical disease and are preferred by all conservative authority.* Many agree with the statement that one (31) (78) (37) of the serious errors of our profession is its *insistence that root canal filling is curative, when as a matter of fact it is only a preservative and preventive procedure* and constitutes but one factor out of many to be considered. Relative statistics are available as follows: Accepting as rarefied any apical area where canal filling was attempted; classifying infection and abscess as rarefaction; recognizing that while all these operations did not induce rarefaction, which might have previously existed, but which in any event *correct root canal filling should have cured, if it be curative of such lesions.* We quote (34)(90) as follows:

(a) Radiographs 1000—13% filled into the apex with 74% rarefaction. 34% imperfectly filled with 64% rarefaction.

(b) Radiographs 1434 2% perfectly filled with 25% rarefaction. 57% imperfectly filled with 42% rarefaction.

Many figures, less accurate, could be quoted, "figures do not lie, but you can lie with figures," none the less these are suggestive.

First—the 2 per cent and 13 per cent illustrate how rarely good canal work is done and 34 per cent to 57 per cent, how much better it could be done. *Second*—compare the correct canal work, small percentage from 2 per cent to 13 per cent associated with 25 per cent to 74 per cent rarefaction and the large percentage of *bad* canal work, from 34 per cent to 57 per cent associated with 42 per cent to 64 per cent rarefaction; therefore, the chances for inducing periapical disease were roughly, as 1 is to 7, whereas, it resulted only as 1 is to 1.5 in *favor of the poorly filled root.* So we note the striking fact that while roughly 7 per cent. perfectly filled show 50 per cent rarefaction; 45 per cent imperfectly filled show but 53 per cent rarefaction; all of which might be discouraging *if no other factor but canal filling is considered.* But there are other (31) (44) (21) (62) (82) (78) factors and *it is likely that few apical foramina are ever filled,* for the reason, *first*: *In the 7 per cent perfectly filled,* no record occurs of 40 per cent multiple foramina, only 2 per cent. of which are filled and, *second*: *Cement* is rarely forced into the apex, tho perfect encapsulation can be done with it; *hard gutta percha* does not close foramina, because from canal filling experience the surfaces must be dry and gutta percha hot for adhesion, yet the apex is never dry, nor the gutta percha hot or under pressure after it reaches apex. *Chlora percha always contracts* (72), tho when made by pumping canal points in chloroform-rosin, which enters the tubuli, adhesion is improved and *silver deposition* (33) is promising but still experimental. (Elaborated in Seminar by Dr. Price.) *If none of the known methods really fill apices, what has protected the subapical tissue and the patient in the defective work of the past and present against infection and reinfection?* It is daily becoming more evident to many investigators *that some process other than the dentist's* (34) (44) (65) (76) *processes is the final equation in root canal treatment and filling and, in the opinion of many, this factor which fills, and the past always has filled or repaired, foramina unfilled, in so-called perfectly filled roots—preventing infection in fifty-eight per cent of imperfectly filled roots, is the complicated reparative process common to all body connective tissues; leucocytic function (endothelial leucocytes, etc.) plus good fibrous tissue, organized by fibroblasts, cementoblast, etc., and these men approve of any method improving apical technic provided, it does not in-*

terfere with this reparative function. They fear chemical tissue invasion more than infection, (2) (34) (35) *because bodily resistance is better prepared against infection than against* (78) *chemical necrosis.*

They also insist, while recognizing this biologic factor, that it cannot be used as an excuse for hasty or slovenly methods, but should prompt the operator to even greater conservatism in medication and asepsis and time and care in technic. Two great schools are still divided (83) (20) (21) (22) (23) (24) (26) (16) (32) (62) (70) in discussion as to whether the granulating or exclusive type of periapical lesion is primary. Decision either way will dictate treatment. In the interim it is safer practice to proceed as in all periapical diseased tissue had its percentage of infected granulations, even when visibly fistulous and always curette after extraction. Granulomata and cysts are often centrally sterile, but culturable from fibrous walls and necrotic adjacent medulla; so cultural tests, in or thru root canals are unreliable (78) and should also be made thru alveolus. It is well known that such granulations, whatever may be done with exudates, cannot be drained thru root canal; many operators recognizing this claim in *infected teeth, septic pulps and periapical disease* (see classification) a high percentage of cures by destroying organized granulations and the contained infective element via the canal by strong acids; (64) (54) (49) (40) (33) (29) (80) phenol sulphonic, sulphuric and by sodium potassium or by ionization or strong formalin, phenol or cresol left in and thru the apex; some stating that staphylococcus infection (41) can always be so cured, but the streptococcus rarely. Others assert that in *infected teeth, septic pulps and periapical diseases* (see classification) that no amount of perforation and encapsulation, ionization or medicinal treatment will sterilize (76) (82) (67) (60) (55) (37) (34) (35) and cure a septic apex surrounded by infected adjacent tissue; that all canal treatment, except attempted dentinal sterilization, to be followed by apiectomy, is time wasted; that *such practice is bad surgery, no instance being known in modern surgical practice of cauterization of deep bone granulations, leaving them in situ and anticipating repair;* (78) *that all diseased apical tissue together with the apex must come out* by modern apiectomy; if that means *the tooth; it too should come out* by modern surgical methods: and pathologists, histologists and clinicians in majority agree with this opinion. There is a noticeable tendency among all those quoted to divide patients into *sick* (30) (39) (44) (67) and *well* and to *treat septic teeth, periapical disease* (see classification) by canal methods for the well and do apiectomy or extract them for the sick. *This is a dangerous doctrine.* Such a diagnosis cannot be made "off hand" by the dentist, in cases, many of which puzzle an entire hospital staff. The ambulant patient may be very ill, the bedridden not so ill; this whole question is one of comparative susceptibility, little understood by anybody, particularly dentists. *If periapical disease is such a potent factor for ill health as we have been told,* (24) (25) (7) (23) (26) (62) (67) (68) (70) (76) (78) *safer practice would consist in curing or removing it promptly before the well get sick and in not experimenting with it by root canal treatment in the sick, that they may the more promptly get well.*

Bibliography.

0 Century Dictionary.

1 Barker, L. F., "The Clinical Diagnosis of Internal Disease."

2 Noyes, F. B., "Dental Histology and Embryology."

4 Tomes, C. S., "Dental Anatomy."

5 Smith, A. Hopewell, "Histology and Patho-Histology of the Mouth and Teeth."

6 Broomell, I. N., "Anatomy and Histology of the Mouth and Teeth."

7 Grieves, C. J., "Systemic Pus Poisoning Associated with Diseased Dental Apical Regions." Items of Interest, 1911.

8 Stein, J. B., "A Study of the Maxillae with

regard to their Blood and Lymph Supply." Items of Interest, 1908.

9 Broomell, I. N., "The Genesis of the Blood Supply to the Teeth." Items of Interest, 1908.

10 Broomell, I. N., "The Adventitious Effect of Large Masses of Gold in Contact with Tooth Tissues." Dental Cosmos, 1910.

11 Latham, Vida A., "Neoplasms of the Pulp." Journal A. M. A., 1904.

12 Latham, V. A., "Some Pathological Features of the Pulp, 1906." Journal A. M. A.

13 Waugh, L. M., "Deviation from the Normal in the Teeth and their Supporting Structures." Journal Allied Societies, 1917.

14 Bunting, R. W., "Report on Pathology of the Dental Pulp." Items of Interest, 1914.

15 Bunting, R. W., "Secondary Calcification of the Tooth Pulp." Dental Cosmos, 1911.

16 Hartzell, T. B., "Report of the Minnesota Division of the Scientific Foundation and Research Commission." Journal N. D. A., 1915.

17 Black, G. V., "Special Dental Pathology."

18 Stein, J. R., A Preliminary Report on the Condition of the Teeth Resulting from Extirpation of the Contents of the Mandibular Canal in a Dog." Items of Interest, 1910.

19 Cryer, M. H., "Normal and Pathological Anatomy of the Alveolar Process and Adjacent Tissues." Items of Interest, 1903.

20 Thoma, K. H., "Diagnosis and Treatment of Alveolar Abscess." Items of Interest, 1917.

21 Thoma, K. H., "Histopathological Study of Dental Granuloma and Diseased Root Apex." Journal N. D. A., 1917.

22 Thoma, K. H., "The Histological Pathology of Alveolar Abscess and Diseased Root Ends." Dental Cosmos, 1918.

23 Thoma, K. H., "Oral Abscesses."

24 Rosenow, E. C., "The Relation of Dental Infection to Systemic Disease." Dental Cosmos, 1917.

25 Rosenow, E. C., "The Pathogenesis of Focal Infection." Journal N. D. A., 1918.

26 Hartzell-Henrici, "The Pathogenicity of Mouth Streptococci and their Role in the Etiology of Dental Disease." Journal N. D. A., 1917.

27 Howe-Gillette, "Studies of Dental Caries." Journal N. D. A., 1917.

28 Howe, P., "A Study of the Micro-organisms of Dental Caries." Dental Cosmos, 1917.

29 Buckley, J. P., "The Diagnosis and Treatment of Destructive Diseases of The Dental Pulp and a Method of Removing the Dead Tissues from the Canals." Dental Review, 1917.

30 Best, E., "Technic of Pulp Canal Surgery." Dental Review, 1917."

31 Grove, C. T., "Mouth Infection with Causes and Treatment for Periapical Abscess." Journal N. D. A., 1917.

32 Grove, C. T., "The Treatment of Root Canals with Putrescent Pulps." Journal N. D. A., 1918.

33 Howe, P., "A Method of Sterilizing and at the same time Impregnating with Metal affected Dental Tissue." Dental Cosmos, 1917.

34 Brooks & Price, "The Relative Efficiency of Medicaments for the Sterilization of Tooth Structure." Journal N. D. A., 1918.

35 Pond & Price, "Electrolytic Medication (Physiological and Dental Aspects.)" Journal N. D. A., 1917-18.

36 Eisen-Ivy, "Factors to Consider in the Retention of Teeth to be used as Abutments for Bridgework." Items of Interest, 1917.

37 Noyes & Dewey, "Study of the Pathology of the Peridental Membrane." Journal N. D. A., 1917.

38 Ward, M. L., "What Kind of Bridgework to Apply." Journal N. D. A., 1917.

39 Best, E., "Trouble with and from Pulpless Teeth, Dental Cosmos, 1917.

40 Discussion of Buckley's Paper, Journal N. D. A., March, 1917.

41 Ottolengui, R., Discussion Buckley's paper, Journal N. D. A., March, 1917.

42 Ivy, R. H., "Cooperative Organization in Dental and Oral Surgical Practice, Especially in the Diagnosis and Elimination of Chronic Mouth Infection as a Factor in Systemic Disease." Dental Cosmos, 1917.

43 Buckley, J. P., "The Chemistry and Pharmacology of the Treatment of Pulpless Teeth and their Sequellae including the Preparation of the Canal for Filling." Journal N. D. A., 1917.

44 Coolidge, E. D., "A Discussion of the Responsibility of the Dental Profession in the Diagnosis and Treatment of Conditions in and about Root Canals." Items of Interest, 1918.

45 Callahan, J. R., "Rosin Solution in Root Filling." Dental Summary, 1914.

46 Crane, A. B., "Therapeutics and Surgery of Alveolar Abscess." Dental Cosmos, 1911.

47 Crane, A. B., "A Call for Standardization in Root Canal Treatment." Dental Cosmos August, 1917.

48 Callahan, J. R., Multiple Apical Foramina of Tooth Roots." Journal N. D. A., 1916.

49 Ottolengui, R., Round Table. Items of Interest, December, 1916.

50 Dunning, W. B., "New Standards in Root Canal Filling." Dental Cosmos, June, 1916.

51 Buckley, J. P., "The Treatment of Pulpless Teeth." Journal N. D. A., January, 1918.

52 Grove, C. T., "Mouth Infection and Treatment." Dental Cosmos, 1917-1916.

53 Broomell, N. I., "A Plea for the Removal of Healthy rather than Diseased Pulps." Items of Interest, March, 1917.

54 Editorial, "A Reasonable Course to Pursue in the Treatment of Pulpless Teeth." Journal N. D. A., October, 1917.

55 Editorial, "Management of Pulpless Teeth." Dominion Journal, 1917.

56 Waugh, L. M., "Radiography as an Adjunct in Practical Dentistry." Dental Cosmos, 1917.

57 Brophy, T., "American Journal Roentgenology."

58 Hinman, T. P., "Therapeutics and Treatment of Pulp Disease." Journal N. D. A., 1917.

59 Grove, C. T., "The Biology of Multi-canaliculated Roots." Dental Cosmos, 1916.

60 Noyes, F. B., "The Mouth in the State of Health." Journal Allied Societies, 1918.

61. Dewey & Noyes, "Study of the Lymphatic Vessels of the Dental Pulp." Dental Cosmos, 1917.

62 Logan, W. H. G., "Chronic Oral Infections Associated with Teeth and Their Treatment." Dental Summary, 1914.

63 Best, E. E., "Pulp Operations and Technic of Root Treatment." Dental Summary, 1914.

64 Prinz, H., "Electre Sterilization of Root Canals." Dental Cosmos, 1917.

65 Callahan, J. R., "Some Root Canal Problems." Journal N. D. A., 1917.

66 Hanazawa, K., "A Study of the Minute Structure of Dentin, Especially of the Relation between the Dentinal Tubules and Fibrils." Dental Cosmos, 1917.

67 Hewitt, W. S., "Precautions to be observed in the Care of the Mouth Infections with Regard to the Preservation of Health." Dental Cosmos, 1916.

68 Fischer, M. H., "The Relation of Mouth Infection to Systemic Disease." Lancet Clinic, 1915.

69 McCoy, J. D., "Dental and Oral Radiography."

70 Duke, W. W., "Oral Sepsis in Its Relationship to Systemic Disease."

71 Burgess, J. K., "Bridgework for the General Practitioner." Dental Cosmos, 1916.

72 Manning, J. R., "A Query as to the Practical Usefulness of Gutta Percha in Completed Work with an Attempt to Supply a Logical Substitute therefore." Dental Cosmos, 1916.

73 Editorial, "Interpretation of Dark Shadows in Radiographs." Pacific Dental Gazette, 1916.

74 Editorial, "Standardization of Dental Operative Procedure." Dental Cosmos, 1917.

75 Novitzky, J., "Technic for the Removal of Dead Teeth." Journal California State Dental, 1917.

76 Grieves, C. J., "Dental Periapical Infections as the Cause of Systemic Disease." Dental Cosmos, 1914.

77 Tileston, H. B., "The Application in Practice of What is Known Concerning the Diagnosis and Treatment of Diseases of the Dental Pulp." Dental Cosmos, 1917.

78 Grieves, C. J., "The Clinical Status of the Gingivo-Peridental and Dento-Alveolar Infective Focal Portals." Journal N. D. A., 1918.

79 Rhein, M. L., "The Retention of Devitalized Teeth without Danger of Focal Infection." Journal A. M. A., 1917.

80 Rhein, M. L., "Scientific Treatment of Root Canals." Dental Cosmos, 1911.

81 Rhein, M. L., "The Technic of Pulp Removal and Root Treatment Associated Therewith." Dental Cosmos, 1915.

82 Grieves, C. J., "The Relation of the Vitality of the Periapical Cementum and Adjacent Tissues to the Patient's Health and the Status of the Dental Profession." Dental Cosmos, 1915.

83 Rhein, M. L., "Treatment of Inaccessible Root Canals." Dental Summary, 1910.

84 Ottolengui, R., Around the Table. Items of Interest, July, 1918.

85 Eisenstaedt, J., "An Investigation and Report of the Microscopic-pathology of the Cementum and Peridental Membrane in an Extensive Case of Chronic Osteitis, so called Alveolar Abscess with a Sinus." Journal N. D. A., 1917.

86 Ottolengui, R., Around the Table. Items of Interest, December, 1916.

87 Rhein, M. L., "What Proportion of Pulpless Teeth Should be Saved." Dental Review, 1918.

88 Gilmer, "Chronic Alevolar Abscess and Systemic Disorder."

89 Symposium, "What Root Canal Technic Should be Practiced in Army Cantonments and for Children in Public Dental Clinics." Items of Interest, 1918.

90 Hyatt, T. P., "An Interesting Study of Two Thousand Seven Hundred and Eighty-seven Radiographs taken from One Thousand, One Hundred and Forty Patients, During 1916 in the Dental Section of the Metropolitan Life Insurance Co." Items of Interest, 1918.

91 Dorland, "The American Illustrated Medical Dictionary, Ninth Edition."

92 Talbot, E. S., "Interstitial Gingivitis and Pyorrhea Alevolaris."

93 Thoma, K. H., "Oral Roentgenology."

94 Davis, W. B., "Nasal Accessory Sinuses."

96 Hartzell, T. B., "Some Evidences of the Importance of the Dental Path as a Source of Serious Localized and General Infections." Journal N. D. A., 1915.

APPLIANCES, INSTRUMENTS AND TECHNIC TO BE USED IN PULP CANAL OPERATIONS.

By Elmer S. Best, D. D. S., Minneapolis, Minn.

(Read before Michigan State Dental Society.)

IN PRESENTING this subject, the writer is not attempting to show upon what teeth and under what conditions pulp canal operations are indicated. The incorporation of this phase of the subject would make the paper entirely too cumbersome; hence, it is omitted. However, it is of some importance that a little light be cast on this very important part of our work and the writer wishes to state that in his opinion certain conditions should prevail, viz:

1. Infected areas surrounding non-vital teeth are a distinct menace and should be removed.
2. A large number of non-vital teeth will and are being removed.
3. Very few vital pulps will be removed in the future.
4. Due thought should be given to the strategic value of certain non-vital teeth when removing a large number of such teeth in a mouth.
5. Never attempt to do a pulp canal operation unless prepared and equipped to do it thoroly and aseptically.
6. Under favorable conditions pulp canal operations are distinctly indicated, and we can proceed with our work with a reasonable assurance of success.

With these thoughts in mind, the writer wishes to present to you certain internal mechanism and certain ideas which in his hands have enabled him to do this operation in a manner much superior to that accomplished by him a few years ago.

The operation is not complete as yet and before it is, we will have made some very decided changes in our technic.

STEPS OF PULP CANAL OPERATIONS.

Radiographic Examination of Tooth to be Operated Upon. Test Vitality—Battery.

VITAL.

Local Anesthetic.

1. Remove decay but do not enter pulp chamber.
2. Spray mouth.
3. Paint gums where dam is to be applied with iodin.
4. Apply dam.
5. Apply Tr. of Green soap, water, iodin, and alcohol to crowns of teeth included in dam.
6. Apply 1% Chlorazene to cavity on pledget of cotton.
7. Open pulp chamber, cut away liberally.
8. Enter large canal with barbed broach and try to remove en masse.
9. Absorb hemorrhage resulting place dry absorbent point in canal and temporarily close with temporary stopping.
10. In small canals:
    1. Try xxx Barbed Broach and if canal will accommodate it try to remove pulp en masse.
    2. If xxx Barb is too large, try xxx short barb.
    3. Try apex curette.
    4. If none of these will pass into canal use the pathfinder. Work it

carefully into the canal, apply 30% H2 SO4 and by a stirring motion, press back the walls of the canal as they are softened by the acid.

5. Apply Bicarb. of Soda.

6. Now use short barbed and file down walls of the canal.

7. Use larger sizes of short barbed broach.

8. Sometimes Kerr file is indicated to open a constriction in a canal.

9. Use a xxx Barbed Broach.

10. Use apex curette and work faithfully and diligently, removing debris from apical portion of the canal.

11. With Kerr files and short barbed broaches enlarge canal to required size. Seal a mild dressing with oxy-chloride of zinc cement. Moisten cavity with Xylol. Close with stopping and dismiss patient. Caution patient to not bite on tooth for fear of splitting the crown.

12. (Next appointment). Use measurement wires.

13. Fill canals.

STEPS OF PULP CANAL OPERATIONS.

Radiographic Examination of Tooth to be Operated Upon. Test Vitality—Battery.

NON-VITAL.

1. Remove decay and open pulp chamber. Wash out freely.

2. Spray mouth.

3. Paint gums where dam is to be applied with iodin.

4. Apply dam.

5. Apply Tr. of Green soap, water, iodin and alcohol.

6. Apply 1% chlorazene to cavity on cotton.

7. With barbed broaches or apex curettes remove contents of canal for about ⅓ the length of the canal.

8. If canals contain gutta-percha cones, remove with Xylol.

9. Seal in each canal independently with oxychloride of zinc cement, formo cresol.

10. Moisten walls of cavity with Xylol, fill cavity with copper stopping. Caution patient to not bite on tooth for fear of fracturing it.

11. Next sitting remove dressing and wash out with normal saline sol. Use Sodium Potassium and cleanse canal, but do not enter apical ⅓. Place dressing of 1% chlorazene for a few moments. Dry out and if the peridental membrane is broken as shown in radiograph, seal formo cresol in apical portion. Otherwise use oil of cloves unless a pronounced odor of putrefaction is still present; in which event do not hesitate to use formo cresol.

12. Use measurement wires.

13. Next sitting clean out apical portion with apex curettes. Ionize, and if free from bacteria seal the foramina and fill the canal.

NOTE: In view of the responsibility that rests upon the operator in retaining teeth that have been pulpless for some time, it becomes a matter of necessity that careful bacteriological examinations be made of all such canals and they must not be filled until they are bacteria free.

FILLING THE CANALS.

In the event of the peridental membrane being destroyed, a limited amount of encapsulation is indicated but it is not indicated when a vital pulp has been removed.

In filling canals four methods can be employed.

1. Chlora-percha and gutta-percha cones.

2. Rosin and chloroform placing the solution in the canal before we do the cone and pumping the cone up and down in the canal until dissolved.

3. Placing a cone that goes about to the apex in the canal first. Then placing Rosin Chloroform solution in along side the cone. Withdraw cone slightly, cut off and remove as much of the cone as possible and with fine canal pluggers

condense the cone in the apical portion. This is many times the best method to employ.

4. Cutting off a piece of a cone and placing it on the end of a carefully measured canal plugger and deftly placing it at the end of the root.

Figure 1.

Rubber Dam Holder.

In using a rubber dam holder, we should select one that holds the rubber firmly in place during the operation and is of a type that can be sterilized. Figure 1 shows such an appliance and Figure 24 shows it in use. Note particularly the manner in which the lips and cheek are drawn away from the field of operation.

Figure 2.

Rubber Dam Clamps.

These are kept in a small petrie dish containing equal parts of alcohol and glycerine. All clamps are placed here after sterilization. (Figure 2).

Burs.

These are kept in a small petrie dish containing equal parts of alcohol and glycerine. All burs are placed here after sterilization. (Figure 3).

Used Burs, are, as soon as removed from the hand piece, placed in a 1% solution of Chlorazene in an open dish. (Figure 3).

Figure 3.

Absorbent Points.

There are two methods of keeping these points. They are wrapped in 6x6 gauze and sterilized, or are placed in glass jars and sterilized. (Figures 4 and 5).

Pulp Canal Applicators.

These instruments mounted in aluminum handles are for the purpose of absorbing moisture from the canal or wiping out a canal. The cotton on these instruments is not left in the canal as part of a dressing. These instruments must be wrapped in such a manner that the cotton is locked on the instrument and will not loosen up during the process of sterilization. The material of which the instrument is made must be

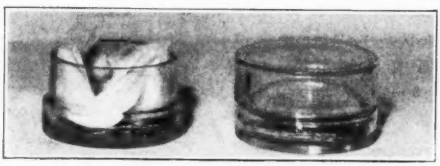


Figure 4.

of such a nature that it will not rust and yet must be very fine. The tantalum instrument of the Twentieth Century Dental Broach Company and the three non-rust canal probes manufactured by the Detroit Dental Manufacturing Company are particularly suited to this work. In wrapping the instrument, a small piece of cotton is placed between the thumb and first finger of the left hand. (Figure 6). Then the instrument is laid on the cotton and seized with finger and thumb. Some of the cotton is left projecting, and this is now seized with the finger and thumb of the right hand and together with the instrument is rolled. (Figure 7). This locks the cotton at both ends. (Figure 7). The instruments in one-half dozen lots are wrapped up in 6x6 gauze, and put thru the sterilizer. Upon the completion of sterilization they are removed and placed in a glass jar ready for use.

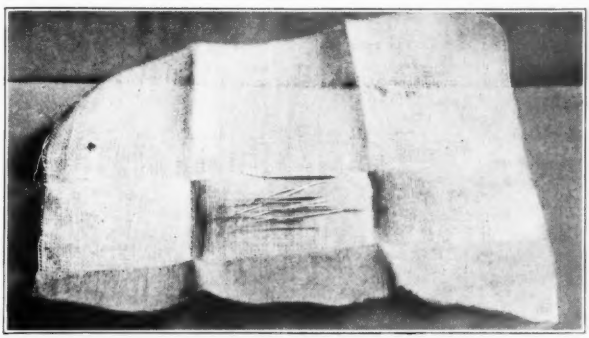


Figure 5.

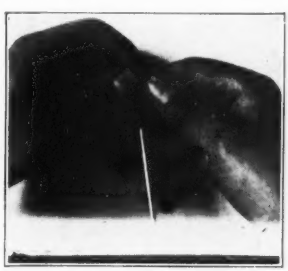


Figure 6.

SEALING DRESSINGS.

1. Gain access to all canals.
2. Seal dressing in each canal independently with oxychloride of zinc cement.
3. Moisten walls of cavity with Xylol.
4. Fill with temporary stopping.

CHLOROFORM AND ROSIN SOLUTION.

Four grains Rosin.
Three drachms Chloroform.
In making this preparation use the

rosin that is used by violin players on their bows. Care must be taken that the solution does not become two thick due to the evaporation of the Chloroform.

Chlora-Percha.

White Base Plate Gutta-percha is cut in one-half inch squares and put in alcohol for about one hour. Then placed in a receptacle and covered with chloroform. When dissolved, strain thru gauze into permanent receptacle. Care must be taken to not allow the solution to become too thick. (Figure 8).

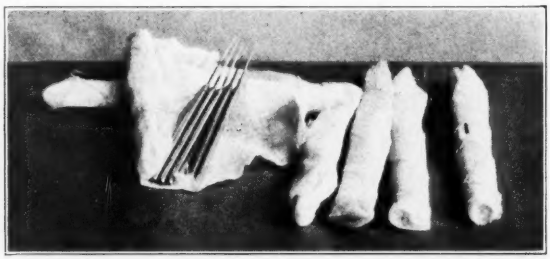


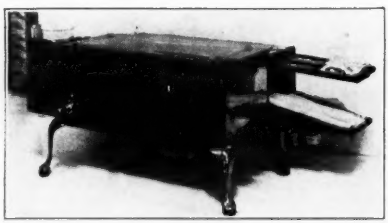
Figure 7.

Figure 8.

Measurement Wires.

The use of measurement or diagnostic wires is quite essential in efficient Root Canal work. In the first place, it is quite impossible for us to know how near we are to the apex while operating, and one of the most serious mistakes we can make is to pass prematurely thru a foramen carrying with our instrument, infectious material. Great stress should be laid on this point.

Also in the event of the patient feeling pain in a tooth while operating we are at a loss to know whether it is pulp tissue or peridental membrane. Place a measurement wire in the canal and ray the case. The end of the wire being at the point of sensation we can easily tell when we see our film whether or not we were still operating in the canal or were thru the root end.



Halverson Sterilizer.

Figure 9.

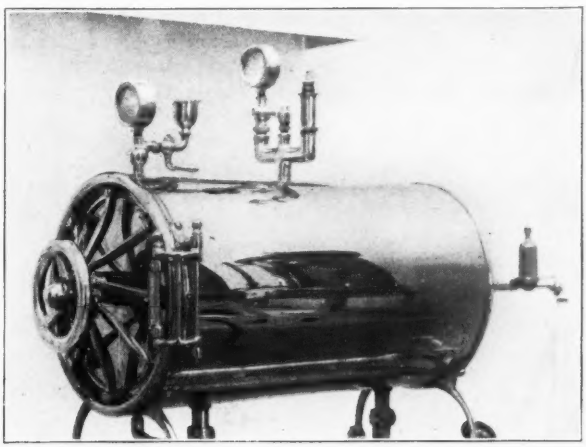
Xylol.

It is a synthetic preparation and is used for the purpose of dissolving old gutta-percha canal fillings. It is applied to the gutta-percha, allowed to remain for a few moments, and then the

gutta-percha is worked out with Rhein pics or Kerr reamers.

ROOT CANAL SYRINGES.

The canal should be frequently washed out but care must be taken not to force any solution thru the canal into the periapical area, and that no moisture remains in the canal while operating. In the latter event, the moisture, during our instrumentation, will be slowly worked thru the apex. It is a useful and efficient instrument in skilled hands, but is capable of doing a great amount of damage. (Figure 11).



Small autoclave for sterilizing cotton pellets, sponges, towels, etc.

Figure 10.

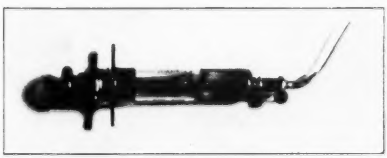


Figure 11.

TRANSILLUMINATING LAMP.

Sometimes when we have lost the course of a canal, apply a small drop of iodin, allow it to remain for a few moments and then remove it with alcohol. A small amount will penetrate the unopened canal and by placing the transilluminating lamp (Figure 12) along side the tooth it will so illuminate the inside that we can easily locate the tiny dark spot which is the entrance to the canal. Then by placing a very rigid instrument on this spot we can force our way into the remainder of the canal.

Figure 12.

ROOT CANAL INSTRUMENTS.

Instruments ready for Root Canal Operation. (Figure 13). The instruments to the right are those actually used in the canal. Those to the left which are used

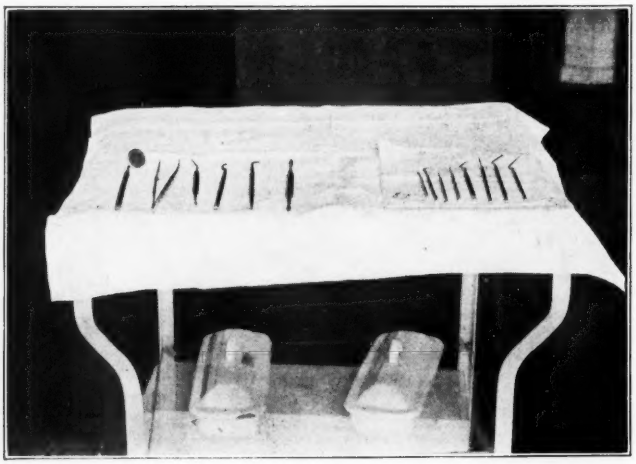


Figure 13.

outside the canals and which soon become contaminated are kept separated.

COTTON PELLETS.

The Richmond pellets are used for this purpose and are prepared in two ways: in the small petrie dishes or in 6x6 gauze. (Figure 14).

Figure 14.

GUTTA-PERCHA POINTS.

Are flattened to facilitate grasping with pliers. This can be done with a pair of pliers with serrated beaks. (Figure 15).

PULP CHAMBER BURS.

In opening a pulp chamber we want a bur that has a long cutting surface. It should not cut on the end as we must be careful not to mutilate the floor of the pulp chamber. Mounted stones serve nicely in smoothing up the walls. (Figure 16).

While operating in root canals, we should simplify our work as much as possible by funneling the openings to the

canals as shown in Figure 19. This will facilitate very greatly the passing of instruments, dressings and Gutta-percha points into the canals. It can be performed with flame shaped burs (Figure 17) or with a hand instrument (Figure 18).

Wilmott Castle Sterilizer with mate-

Figure 15.

rial ready to be sterilized. In using this sterilizer, operate it in such a manner that the warm air passes thru the sterilizing chamber for half an hour, then superheated steam for half an hour, then dry warm air again for half an hour. (Figure 20).

A simple little sterilizer for pulp canal instruments. This is made with a four-

Figure 16.

inch electric plate, a two-inch band of brass soldered and set over the plate and a four-inch porcelain dish set in the brass band. Have this band plated and the sterilizer presents a very creditable appearance. (Figure 21).

The four steps in cleansing the crowns of the teeth included in the rubber dam. (Figure 22).

Cotton pellets and Mayo sponges used in curetments and resections. The Mayo sponges, which are made in many sizes, will be found to be very valuable. (Figure 23).

Figure 17.

The Barbed Broach.

Up to within the past four or five years, the instrument which we chiefly depend upon for removing the dental pulp was the ordinary barbed broach. This instrument so little understood, has been the cause of more trouble in this

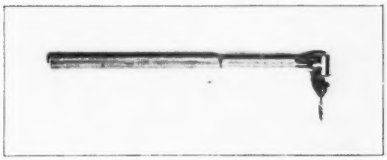


Figure 18.

work than any of us have any conception. If a canal was large enough to accommodate the size generally used, the pulp was removed. If it was not, we went as far as we could and stopped.

Figure 19.

The instrument was, in the main, too large to be of any use in any but the large canals. Most frequently arsenic had been used, and the pulp tissue in the finer canals was relieved of its vitality,

so the contents of such canals were as a general rule left undisturbed.

In the manufacture of this instrument in the finer sizes such as the xxx and xx

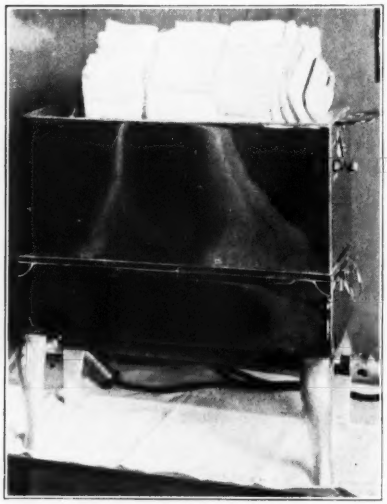


Figure 20.

fine, which instruments have made their appearance in considerable quantities, we find that a large percentage are defective. Hence, in purchasing these instruments, beware of a brand that is cheap, as it is in all likelihood the discards or defectives you are getting.

The xxx and xx fine barbed broaches have made possible the removal of organic tissue from very much smaller canals than had heretofore been possible.

The instrument is made in a variety of styles:

1. The more common unmounted type.

Figure 21.

1. TINCTURE OF GREEN SOAP.
2. STERILE WATER.
3. TINCTURE OF IODIN.
4. ALCOHOL.

Figure 22.

2. Mounted in long aluminum handles.

3. The Midget Barbed mounted in aluminum handles.

Figure 23.

4. The Short Thumb Broaches for use in posterior teeth.

5. The Right Angle Broach for use in the right angle broach holder. (Figure 25).

THE SHORT BARBED BROACH.

The need of such an instrument has been felt for a long time and its advent means a great deal to operators while working in pulp canals.

It has been realized for some time that

Manner of preparing a patient for a pulp canal operation.

Figure 24.

one of the most efficient instruments used in enlarging canals is the barbed broach, but on account of the comparatively large diameter of a barbed broach its use in fine canals has not been very extensive.

The Short Barbed Broach (Figure 26) possesses many of the advantages of the ordinary barbed broach and in addition has such a reduced diameter that its use

Figure 25.

in fine canals is made possible. It is used solely for the purpose of filing down the walls of the canal and is not used for removing organic tissue from the canal. In using the instrument it is carefully inserted into the canal and withdrawn against the canal wall exerting as much pressure as possible laterally. Never attempt to rotate or twist this instrument in a canal. It is not intended for such a purpose and if put to such use is liable to break and leave a portion in the canal.

The most suitable long handle type is the midget as in this instrument the length of the wire is reduced considera-

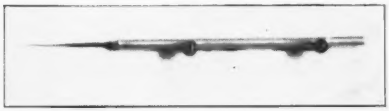


Figure 26.

bly and gives us greater control over the cutting part of the broach.

The Short Barbed Broach comes in various sizes, from xxx fine up to coarse. By simply increasing the size of the instruments we are able to enlarge the canal almost at will.

The instrument is also made for right angle use and is so constructed that it fits the Ivory Right Angle Broach Holder.

APEX BROACH.

Is a combination barbed and smooth broach. (Figure 27). At the extreme tip are placed two or three barbs. It is the presence of these barbs that gives the

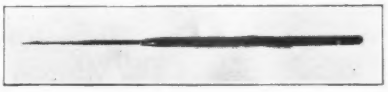


Figure 27.

instrument its operating value. The apex broach is made in three styles: the regular long handle type, the midget, and the right angle.

This instrument has done more than any other instrument to reveal to the operator how far he has come from completing his task of cleansing the canals. After all the other instruments have been

used this instrument slipped into the canal and operated in the apical portion of the canal will bring forth shreds of cotton, small pulp nodules, fibers of pulp tissue and several unrecognizable types of debris which, had they been left in the canal, would have been forced thru the foramina during the process of filling the canal and deposited in the periapical tissues to set up a condition resulting in a periapical infection.

The Fine Smooth Broach.

Until about at the same time that the barbed broaches were changed due to strong pressure brought to bear on the

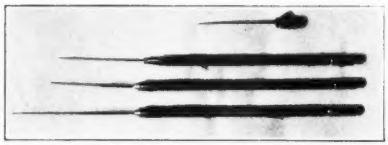


Figure 28.

manufacturer, the smooth broach (Figure 28) was generally used for wrapping cotton for drying the canal or placing a dressing in the canal. However, a new use was found for it. It is used for tracing out or locating fine canals. For this purpose it is without an equal. Its very fineness makes it possible for us to insert this instrument into a canal and by cautiously pushing, turning and twisting it, we are very agreeably surprised in countless instances to find that we have reached the apex. When we have done so, we place a drop of 30% H2 SO4 or Phenol Sulphonic Acid at the orifice of the canal and by a stirring motion we carry the drug around the instrument into the canal. The drug attacks the walls of the canal and by our circular motion we push back the dissolved portion and thereby enlarge the canal.

Many times we are unable to locate a lost canal and trace it to the foramin. A very simple but extremely efficient method is to slightly bend the broach about 2 or 3 millimeters from the point and with this little hook we search out the lost canal.

Many times we can see in our preliminary radiograph that the root curves in a certain direction, and by placing the point of the instrument in that direction we frequently slip into the canal and continue our operation. In the mesial roots of lower molars in case we are working in the buccal canal and apparently meet with an obstruction, by simply turning the point to the lingual, we will probably locate the canal, similarly in case we are working in the lingual canal it may turn to the buccal, and it is in this direction we find the canal.

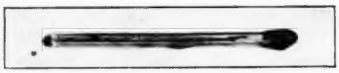


Figure 29.

Sodium Potassium.

The greatest care should be exercised in handling this material. Do not allow the small tube in which the material is kept to come in contact with water. Do not force any blunt instrument into the tube. Seal the tube with warmed wax carefully moulded over the end when finished. (Figure 29). To reach the material when considerable has been used, take a file and file around the tube and break it off. The Sodium Potassium is carried to the canal preferably on Young broaches.

THE VALUE OF THE DENTAL LIBRARY AND MUSEUM TO THE TEACHING OF DENTISTRY.

By Nelville S. Hoff, D. D. S., Ann Arbor.

(Read before American Institute of Dental Teachers, Pittsburgh.)

The Library.

IN PRESENTING this subject for discussion, it seems desirable to make some classification as to material resources that we may make such distinctions as to the relative importance of each class as shall place the matter logically in our minds. And for lack of any precedent, we would suggest the following order of consideration:

1. Historic Literature.
2. Scientific Research.
3. Published Books.
4. Current Literature.

Historic Literature.

Under this title we would include all literature pertaining to dentistry that more or less directly sets forth the development of dentistry from its crudest forms to its present practicable usefulness and professional standing. We are fortunate in having creditable records except perhaps of the earliest ages when nothing of scientific consequence was produced and even the art was so elemental and chaotic as to have little value of a pedagogic character. The writings of Guerini and Koch furnish us all the dependable history necessary for presenting the essentials of dental activities up to the time of the publication of these works, and our current magazine literature, where available, supplies necessary details for special readings or class presentations.

Few students have the necessary training to make good use of libraries without special direction. They lack incentive and because of inexperience cannot read with proper discrimination. For this reason it would seem that the only way this material can be made available to students is to present it in the form of a lecture course that is didactic in form, with citations and expositions that will enable such students as may care to make further personal research to find the material necessary without too great effort. It is curious to notice how students will become interested in particular subjects and want to know more about some particular phase of the subject. Whatever may be the reason, the instructor should be ready to direct such a student to the sources of information which may not only satisfy his curiosity, but which may also give him a keener desire to know more of the whole subject. He is almost sure to be led into collateral readings by this means, that tend to widen his knowledge and stimulate his intellect. This will, of course, necessitate access to the literature involved; and means that every college should have in its building as complete a file of dental literature as possible, that opportunities for developing literary inclinations may be quickly apprehended. It

may happen that the instructor is not always able to cite references that will satisfy a student's desire for conclusive statements on his matters of inquiry; but this very fact may be the best chance for inciting a student to dig up the information for himself if he can be directed to the best records available. If this is not done, there will be little stimulation of the imagination and no intellectual interest in even the most exact matters.

It is obvious that the lecture course, or the text book, on any subject must discuss that particular topic only in its essentials with no intention of exhausting it, or of making a complete exposition of it. Lectures so elaborated would be tedious and uninteresting, and little enthusiasm would be generated even by the most scholarly instructor. In dental history, for instance, it would require all our printed literature, and more perhaps, to exhaust the subject, and very few persons would care to spend so much time on it; but it is necessary that we have access to *all* of this literature that we may have correct information about some particular part in which we may be most interested. Therefore we cannot see how any properly equipped dental college can exist without a complete file of our dental journals, even tho it may not be generally consulted by the student body. Neither can we conceive of a progressive teaching staff which cannot have access to a complete dental library.

If there is a fundamental starting point for the development of an intelligent and progressive professional dentist, it certainly must be found in the history of the development of the profession, such as can only be found in the profession's literature. It therefore seems necessary that our libraries shall not only be as complete as is practicable, that our students may become acquainted with the vitalizing traditions of the profession, but that we may start new impulses for making our profession more learned as well as more useful.

If it were practicable to trace back to its original source every accomplishment made by our profession, we have little doubt that somewhere in our literature will be discovered the *seed thought* which is responsible for every discovery or invention that we so proudly claim as original. We should, for instance, need to go back of Horace Wells to Priestly to find the starting point to one of the world's greatest treasures. The study of the history and the ultimate benefits of practical anesthesia makes for culture, and it is all recorded in our books. We must have such history available to students and they must at least know it in outline, and it will be still better if they can know it in more detail than it is practicable for the usual lecture course to present it.

Dental Scientists and their Work.

What we have said above in regard to our history and its usefulness in developing professional *esprit de corps* may, with perhaps more justice, be cited as a reason for a literary record of the lives of the men who have produced our scientific knowledge and our technical discoveries. We are also indebted to the men who have done so much to develop our calling into a respected and honored profession. It may seem sentimental to hold up the lives and works of these men and to commend the records of their lives and works to students with the idea of making these students more efficient dentists. But what better method have we for inspiring our students with proper professional ideals than to point out the work and character of some of the men who have given us our place in the world as learned and skillful servants of humanity?

One of the most widely known and highly esteemed men in our profession

once said that he left his home in a distant country and located for practice in a large city of this country that he might be near to the men about whom he was reading in the dental journals. He said he wanted to know them personally. His faithfulness to this leading resulted in his becoming not only an honored teacher in a dental college, but one of the most useful practitioners of his art, and a writer of distinction and force. What dental student can read the works of G. V. Black and W. D. Miller, and know of the heroic sacrifices of these men for the cause of dental health, and not be inspired with a hope to one day make some worthy contribution to the calling which he has espoused? While it is true the lives and characters of such men are portrayed in the students' text books, and they are the common knowledge of our instructors, who recognize their work by proper references and citations in the class room, let us hope their personal biographies may some day be put into permanent and accessible form for dental students of all time.

The knowledge that such men have helped us to accumulate we have on file in our literature, and it is highly important that it should be accessible to every earnest student. While it is true that the essential matters are kept alive by our class text books, it is usually in the abbreviated form and is not always kept associated in the personal relation that serves as "the touch of the vanished hand" to vitalize and inspire to a like consecration and achievement.

It is unnecessary to catalog all the men who have helped to build our literature, or perhaps to make more extended comment on the enormous influence their writings may have had, or may yet exert in the future development of our professional life; but we feel that a knowledge of this literature and the opportunity to freely consult it should help to quicken immensely our present professional activities, and be one of the great forces for stimulating personal development on the part of dental students.

Reference and Text Books.

It is the general custom in most schools to require students to buy all text books used in the course, and so far as they are willing, to urge the purchase of other books on the various allied subjects. In some instances the owning of a text book is made the requirement for admission to the classes. I will not take your time here to discuss the abuses or rather the prevalent neglect on the part of the students in individual ownership of competent text books on all subjects. It is a somewhat vital subject, as no student can do himself or his instructor justice who does not possess and study his text book along with his course. In some subjects there are several books to choose from, and it can hardly be expected that all approved text books on every subject of the curriculum will be in the possession of all the students. It therefore becomes necessary for the college library to have a sufficient number of reference books not required in the course in its reading room that students may look up citations by the instructor. These books should be available at such hours as students may have time to consult them. This involves a sufficient number of such books as to make it possible for students to either withdraw them for home reading, or the constant attendance of the librarian and an open reading room. Perhaps the open reading room at stated hours with an attendant will meet most situations better than the loan plan; because by the loan system books are badly used up and are often lost entirely. In spite of the expense involved, we believe it would add enough to the general advancement in scholarship, to justify the expense of providing students with every possible facility for access to this literature.

Current Literature.

Included under this heading would be the periodical magazines and other occasional contributions that cannot be classified as books. It is the custom of most colleges to display in the college reading room, copies of the monthly dental journals, but in very few colleges, so far as we know, is there any definite plan of calling the students' attention to special articles, or to a systematic reading of the journals. There is nothing that could be done to promote the reading of our current literature so much as the organizing of a course of systematic journal reading under the direction of a competent instructor. It would establish a helpful habit for the future and it would create a live interest in the studies especially of the upper class men.

It is a well known fact that dentists do not read their current literature adequately or in the best way to get the most out of the time devoted to its reading, and the lack of proper training in college is no doubt much to blame for this.

It would not be an expensive matter to have on the tables of the college reading room several copies of all the journals published. In fact, the publishers would be glad to make liberal concessions if assured that their journals were to be made useful in the development of literary habits. Students ought to be shown how to read with discrimination, and also to record for future reference articles that may be helpful for consultation in writing papers for dental societies and for use in research, or that may be utilized in practice.

In dental college libraries, and in occasional private libraries, sets of journals are saved and bound, but as a rule few private practitioners care to bind more than one or two journals. It is possible, however, to preserve by some such means as a card index or letter file case, articles taken from magazines, which may be classified in the file so that they are easily and quickly found when wanted. A student can be shown how to preserve his readings so that he will not only take pride in his collection, but he will become a discriminating collector as well as have the statisfaction of being known as a well posted and intelligent professional man, and all because he has learned to read and collect only those things having scientific and professional values.

The Museum.

In considering the museum as an educational factor we should think of it as a collection which shall serve the purpose of recording facts that illustrate and have influenced in some way the development of our science and art. It should contain exhibits primarily that serve to illustrate the typical and normal. The abnormal and atypical where they illustrate frequent deviations, especially when the causes can be prevented by remedial agencies, are also important. Just how far effort is justified in the collection and exhibition of the monstrous in pathology, or the errors of the practitioner in technical treatment, we shall have to decide on the basis of individual merit as to its helpfulness as illustrative material.

A museum showing only the anatomically perfect specimens may not be so interesting because of its monotony of perfection; and on the other hand, remarkable contrasts such as are exhibited in extreme deformities attract attention and accentuate the ideally normal.

The interest of the average student in dental museums is claimed by the exhibits of the peculiar or monstrous, and it may be wise to cater to this taste in order that exhibits of greater significance may be brought to his notice.

Dental museums ordinarily seem to be the result of chance, or to express the

individuality of an enthusiastic member of the faculty for a particular subject. It is therefore difficult to outline a classification except on a theoretical basis, which no considerable number of teachers would probably accept. For the purpose of this discussion we would classify the dental museum that shall have an instructive value for students in accordance with the following scheme.

1. History and Curios.
2. Anatomy and Pathology.
3. Illustrative Material for Class Purposes.
4. Collateral Science and Art.
5. Technical Material.

History and Curios.

Historic material of dental concern may be of great variety and limitless almost in quantity. Pictures of the founders and promoters of our science and art can be of great value, especially if accompanied with adequate explanatory information. The ideals and works of our great men ought to be held up to our students, who some day will do great things perhaps, if the right incentive appeals to them. As we value mostly the records of our great men, why not keep their works perpetually before our students? A picture gallery would attract and might inspire some young men to higher ambitions. The books such men have contributed to the cause, and their casual contributions which may have served to develop some technical principle or scientific fact of more or less value, if attractively exhibited should contribute to the general culture of students coming under such influences. Pictures, books and other illustrations of these men of character are obtainable to a limited extent, and reproductions in lantern slides or reprints could be had of the more rare specimens, provided any interest in this direction were developed and the need were demonstrated.

Curios of Literature and Art also have a definite value, and the variety and quantity of such material that can be accumulated by persistent effort is surprising. Every dentist who has been in practice for a number of years will have accumulated something of great interest as a curio if not of considerable historic interest. Books, literary articles, instruments and appliances, incidents of practice, and other data of historic interest should, to a limited extent, form a part of every college collection not only for the sake of preserving as complete a record of our profession as is possible, but also that these matters may serve to give students a broader view of the dental field of achievement. If such material is wisely collected and displayed, it will be an educational factor of definite, tho perhaps, not of ostensible consequence.

If this historic material is used by the teaching faculty in illustration of class work, as it can very well be used occasionally, it may be made of much greater value than when it is simply displayed in a glass covered case.

Anatomic and Pathologic Exhibits.

As anatomy is the fundamental science on which our knowledge of the human body in health and disease is based, it would seem that every possible help to a complete understanding of that part of the human body in which the dental student is particularly interested should be made available. We take it for granted that the necessity for a collection of human crania in the possession of every school is evident whether any attempt to have a complete museum is made or not.

We should include under the head of anatomy, all the biologic studies, such as physiology, histology, etc. A complete anatomic museum of the human head and face may not be

within the reach of many dental colleges, but every college museum can and should have a display of human crania and teeth with the muscles and the nerve supply. Such, for instance, as the jaws and teeth with muscles, nerve and blood supplies. To this can, and should be added, when practicable, a complete exhibit of the developing teeth from the pre-natal to the senile period of life. Sets of these preparations are available at moderate cost, and they are of exceptional value for class room purposes as well as museum specimens. Lantern slides and pictures are also procurable at much less expense and are fairly good substitutes for the actual specimens. Charts and drawings are sometimes used, but as a rule they are not interesting unless displayed in an attractive manner.

In dental anatomy there is a great opportunity for displaying specimens of teeth in the different stages of development with their environments. These may be shown by prepared specimens of typically normal conditions. Specimens showing the teeth in typically normal developed arches, with normal occlusion and articulation, should be shown in special exhibits apart from malformed teeth and arches. In another exhibit a similar exhibit may be made of the most usual malformations to bring out the normal in type by contrast with the abnormal. A great many colleges have exhibits of these specimens, but so heterogeneously arranged that they have little value as material for instruction. As dental anatomy is one of the most important subjects taught in colleges, it can hardly be overdone, except that sometimes the mistake is made of confining it almost entirely to the study of surface form of whatever extracted teeth may be available rather than of selected typical teeth.

It is possible to accumulate a complete collection of teeth showing typical as well as the usual abnormal forms. These, if properly mounted and arranged will be most convincing and they can be photographed and shown enlarged by lantern slides to larger classes when desirable.

Cut sections of typical teeth, both longitudinal and transverse, properly mounted and labeled, are shown in normal order of position in the arches and will make a useful and desirable illustration of the internal structure of each tooth. Such specimens are procurable and should have an important place in every dental museum.

Of less value perhaps, but of great interest, is a collection of malformed teeth and of casts showing the teeth in malposition. The malformed teeth can be mounted in such a way as to permit of identification by suitable labels, and of inspection of every surface. The number of such specimens need not be limited, but the collection would be more valuable if some system of classification that will bring out most distinctly to the student's eye and mind the lesson each group or individual tooth is intended to show.

In comparative anatomy there is an extensive opportunity to impart most valuable information by an exhibition of only a few well selected specimens which show the modification of teeth in nature to meet the various environments and food habits of the different classes of wild and domestic animals.

It is a most difficult matter to impart to the average student the functions of human teeth without reference to the forms of teeth in various animals as compared to man. It is so much easier to teach not only the anatomy, but the nomenclature of the human dentition by comparison with the anatomy and function of animal teeth, that it is almost essential that a course in comparative

odontology should accompany the course in human dental anatomy. The instruction in comparative anatomy is greatly facilitated by a wisely selected collection of animal crania, or by good lantern slides or charts of the same. Where the masticating functions are highly specialized, the anatomical forms are greatly accentuated to meet this condition, and it is easy to make plain the comparative functions of similar organs in man, where the organs and their functions are not so well defined. Therefore, a museum of comparative odontology or its equivalent should be an important item in every dental museum.

Pathologic specimens are always interesting as curios and the tendency is generally to exaggerate in this direction, because such specimens are plentiful. Every one saves the curious and the unusual specimens, and many times the histories make these specimens of great value for the bearing they have on diagnosis and therapeutic treatment. There is usually a temptation to overload museums with this class of material, which it is difficult to classify or make valuable as teaching specimens. It takes up valuable space and for exhibit purposes it requires careful labeling to give it instruction value. It is more valuable in the hands of the teacher, as he can point out the direct as well as the related bearings on disease and its treatment. An extensive collection of exostosed roots, pulp nodules, or bifurcated single rooted teeth are not necessary to demonstrate the frequency of these conditions, while perhaps a large collection of impacted third molars might be better justified because of the variety of technical procedures needed for their removal.

Whether these collections are small or extensive, they are not valuable in the teaching process unless they are properly classified and displayed with legible labels. Incidentally we would observe that this mounted labeling is an art by itself and should be done by one who not only has a knowledge of all the values of the specimen, but has had experience in making effective this phase of the museum. We can learn much here from the taxidermist.

Microscopic slides of developing teeth and jaws enlarged and colored, and made up as transparencies, may be exhibited in cases with electric light illumination to show specimens of the normal as well as pathologic conditions. Such material is usually in the form of microscopic slides and consequently not available for the student. This form of showing such specimens is better than the preservation of them by the old method of exhibiting them in glass jars, altho there are certain preparations that cannot be exhibited in any other way. While these preparations are largely used by class instructors and are not usually considered museum material, there is here a chance to enforce the class room and laboratory instruction very decidedly and at the same time make the museum a more vital influence than it is ordinarily. Special exhibits of this kind can be made at such times as the classes are engaged with the subjects exhibited. This may be readily done by having suitable cases in which the material can be changed when needed. If properly taken care of, such exhibits may become centers of continual interest and thus justify their preparation.

Illustrative Material for Class Work.

One of the best methods of enforcing class instruction is by means of drawings, charts and samples of technical construction. Very often there is little time during the class hour to study specimens shown and while not all students would take the trouble to more carefully study such illustrations when put on

exhibition, a considerable number would if the exhibits are made so popular as to cause talk among the students. Of course all class material could not be profitably used in this way. By mixing technical and scientific with other educative material in succession a live interest would be generated in the museum exhibits, and a new incentive would be created for individual thinking, reading, and perhaps in investigation. One of the most serious criticisms that has been made on much of our teaching is that students are not trained to think for themselves, may it not be that we are to blame for this because we enforce the system of memorizing unduly, and at the expense of stimulating the imagination by appealing to other senses. There is no other sense that makes a stronger appeal to the intelligence than sight and we may cultivate it to very good purpose by such exhibitions.

Exhibits of Collateral Objects.

Just how far we are justified in giving space to curios and museum specimens that have little or no relation to dentistry, it may be difficult to say. Should it be permissible, for instance, to exhibit the taxidermic specimen of the hen or the turtle to illustrate a form of jaw that has a kind of masticating function and yet no well defined tooth organ? Or how far are we justified in giving space to stuffed birds and animals even tho they enable us to a clearer understanding of the food habits of such animals? All such specimens have educational values, but they require space for proper display and may divert attention from the more desirable and essential features of dental instruction. There is ample justification for exhibits of the human skeleton or its various bones even to the bones of the hands and feet, altho they have no immediate relation to dental functions of any kind. There are also good reasons for including specimens of normal as well as some pathologic tissues of the head, thorax and abdomen, as these are closely related to dental functions, as their anatomic and physiologic form in health and disease is a matter of considerable importance to the dentist. Specimens or pictures of tumors, benign and malignant, especially about the head and face, may very properly have a place in a dental museum. The extent to which museum material of this sort may be desirable will of course depend on the size of the collection or the character of the instruction attempted in individual schools, and the opportunities for adequately displaying it or making it accessible to students. This kind of material deteriorates more rapidly than the hard tissues and it requires periodic attention or renewal and it may be questionable whether it should be attempted except in a small way.

Technical Material.

The great variety of available and useful technical material make this perhaps one of the most important classes of instructional exhibits. It may be divided into two sections for classification; the *Historic* and *Modern.*

Historic Technic. Owing to the fact that there has been preserved much technical material, it is not difficult to secure collections of this class of material that are not only attractive, but that have positive educational value. Such material has been used often to show priority of invention or use of technical procedures. While the temptation here is to display this material in excess of a proper classification, confusion and little advantage often results from such collections. It is possible by judicious selection, to make such a collection as shall give a chronological history of technical procedures from the earliest technical dentistry to the present time, the value of which is so obvious as to need no further comment. A miscellaneous collection of even very good specimens of technical art not properly displayed and labeled has

very small instructional value. There is no more reason for making a miscellaneous display of historic technics than for collecting our magazine literature in a miscellaneous form. A file of dental journals that is not complete and properly bound and indexed is not accessible or valuable. A collection of dental technical processes or facilities that is not orderly arranged is not as valuable or comprehensible as when it is properly and orderly arranged, labeled and adequately described. It may be true that a large number of old fashioned pearl handled instruments with gold and jeweled mountings displayed in a beautiful mahogany case will attract attention and have an educational value, but two or three cases of such materials serve no good purpose, no more than innumerable duplications of the same instrument, however interesting the instrument or the period and practice it represents.

It would be interesting and valuable to have a historic collection of gold foil pluggers, but a complete set of all the different sets of foil pluggers that have been used from the beginning to now would cost quite a sum and take lots of space, and after all be of no great value as a teaching factor. A much smaller display properly classified and described would be much more instructive. This statement may be applied to all other instruments and dental equipment. We have seen at least half a hundred differently made turn-keys, each one interesting in itself, but two or three would illustrate all the essentials necessary to a faithful representation of this class of instruments and their uses.

It would seem that a more orderly and adequate presentation of technical exhibits would be to make a chronologic exhibit of each class of instruments rather than to attempt to show all the instruments of the different periods of technical progress or activity. In harmony with this idea it would be consistent to make an exhibit of the development of any process of a technical character showing the development of the instruments and technic. The development of the porcelain and gold inlay technic could be exhibited in its essential features, but it might be more difficult to present such subjects as oral prophylaxis, conductive anesthesia, or root canal treatment and filling. The aim should be always to present each article or subject in a comprehensive form but at the same time it should be as free as possible from confusion with other and related objects or subjects. In short, a museum, especially of technical objects, should be an exhibit of all that is known of any subject that may serve to picture our knowledge of the technical art of dentistry.

Most dental colleges have more or less of this material on display in the technical laboratories or class rooms, but it is usually not accessible to students for study and is not so arranged that it pictures the subjects in a scientific form. Most modern forms of technical procedure can be placed on exhibition where the student has free access to view and study at his leisure and to his entire satisfaction. By such exhibits attractively displayed, a much better conception of right methods can be given to some students than any word pictures by the average instructor, especially since few of us possess the rare qualification of eloquent and picturesque portrayal.

Our vision therefore of the useful dental museum is one that is not a mere junk shop, or a haphazard collection of every conceivable article of near or remote interest to dental science or art, but a scientifically classified exhibit of such articles as may be classified or grouped to more clearly show what we now know about the correct practice of the art of dentistry; and it may serve to enlarge our knowledge and intelligence of the subject, to exhibit the various steps

which have been taken to lead us up from the crudest beginnings to our present ideals and practices.

Acquiring Museum Material.

The question which naturally arises in the mind of every one who contemplates the realization of such a vision is, how is it possible for all our colleges to accumulate so much material as would be required to make even a moderate accomplishment on such a basis. The expense of collecting and mounting for exhibition purposes and its housing and adequate care would seem impracticable even if the material were to be had, much of which would not be at all available for all our fifty or more dental colleges.

We should not expect that every school would have the means or inclination to make the investment required. Nevertheless, it can, and should, be demonstrated that this feature of instruction is of sufficient importance to justify its cost. Some colleges that are in sympathy with this idea should complete the ideal dental museums. However, we fully believe that it is practicable for every dental college to qualify along this line in a very much larger degree than at present prevails. And further, many colleges have at the present time enough material to make a fairly respectable beginning, which will grow sooner than they think into one of their most important factors. The one great advantage of this kind of instruction is that it makes its appeal to all kinds of students and by the most natural and effective pedagogic method. When once installed, it increases almost automatically and is not a great expense burden. It is never cranky or troublesome, and does not resign, or be continually demanding a salary or grade advance. It receives all proper advances graciously, does all the teaching it can with a consistency and persistence that no other member of the faculty attempts to imitate. It furnishes material for illustrating every subject in the dental curriculum, if adequately equipped. It conserves the time needed for didactic instruction and is therefore economical in the highest sense. The time and expense therefore necessary for its procurement should not interfere with its realization in a larger degree than at present obtains in most dental colleges.

If this ideal should ever become popular in our dental colleges and the systematic collection of material were earnestly begun, we are confident the alumni of the various colleges would send in the needed material for this purpose as fast as it could be mounted and displayed. Besides this, the more colleges that take up with this idea, the more likely duplicates will accumulate that may be exchanged with other museums for specimens that may be needed to complete special collections, which may be difficult to obtain otherwise.

A museum cannot be bought—it must be created. It will take time, and perhaps it may never be entirely completed; but we have all the accumulations of the past and we shall have all the future in which to save and create. If there are not enough of the rare and needed specimens to supply all our museums, there need be no missing links in any displays, as we can use picture illustrations, or we can manufacture duplicates if necessary. There is nothing impossible except perhaps our lack of desire for a satisfactory realization of this vision.

Housing and Care of the Library and Museum.

If a room is set apart for a library, museum and reading room, it must be of ample proportions and properly fitted for this purpose. Of course all the fixtures for future needs may not be provided but enough to show that it is intended to be a permanent and important feature of instruction. If this is done, and someone who is interested to the extent of a good degree of enthusiasm is put in charge, it will be an agreeable surprise how rapidly material will begin

to come in. Often too, from unexpected and possibly disinterested persons contributions will come, all of which of course may not be useful, but enough additions will be made each year to soon make the library and museum a permanent fixture. Occasional opportunities for purchase and exchanges with other libraries and museums will soon add enough valuable material to make it possible to use the library and museum as a direct means of imparting instruction. If it is not practicable to purchase, create or secure contributions of the more rare specimens, it is possible many times to secure photographs, or lantern slides, models, or even descriptions of rare things that would help to make this feature a place where things may not only be seen and examined, but a place where information about rare articles in other museums and libraries may be found. Catalogs of all museums might to good advantage be made with full descriptions of unusually rare treasures. Such material would often be useful for instruction purposes and as a help in securing data for literary and scientific research. In connection with such a catalog, a most helpful plan of clipping and filing the important articles published in the current periodicals, with double card index reference cards of the titles and authors would classify and make easily available all magazine and casual publications. This of course would necessitate a library attendant who was capable of keeping such a system up to date and in proper order. But any library or museum which does not have such an officer cannot serve adequately, and to the extent it is lacking in this respect it is relatively inefficient.

A library and museum that is suitable for the needs of the dental college as it is organized today must be kept up to date in material and sources of information on every subject that is taught in the curriculum. It is asking more from teachers than they are ordinarily able to do, to expect them to provide material for illustrating their lectures and class work; and because the courses in practical dentistry are so nearly related, it is impracticable for most teachers to provide such libraries as are required to keep up with the progress of their own subjects. The loss to the college in the quality of instruction by lack of proper illustrative material or inadequate preparation by its teachers would be immeasurably greater than the actual financial outlay needed to provide this helpful material and making it available to both teachers and students.

The finest collection of museum and library material in existence will be of comparatively small value, unless it is utilized to the best advantage. And of equal importance with the material possessions is the officer whose business it is to see to it that every teacher is kept posted as to new accessories that may be used advantageously in his courses of instruction. Of little value would be a hundred microscopes, or a thousand lantern slides if no teacher ever used them, and the students only knew from the college catalog that they were housed in the museum somewhere.

A library and a museum go out of style periodically, as well as fads in education; and unless some one intelligent enough to keep posted as to the latest things in literature and exhibits of technical art, is in charge of a museum and library, the dust and cobwebs will accumulate in the intellects of the instructors, and the enthusiasm in the class room dies down to an uninteresting performance, and education becomes forced and perfunctory, except in spots where there happens to be a live wire on the rostrum.

My plea is for as good a library and museum in every dental college as it is practicable to secure; and that it be kept as nearly as practicable up to date in every department; and that a capable custodian shall have charge of it; and also that every instructor shall have enough interest in his department of the

museum to keep it up to date; and finally, that every instructor shall make the most use of it that is possible for the benefit of his students and the generation of a universal attitude of inquiry and learning in the college.

Discussion.

Arthur D. Black, Chicago.

Dr. Hoff has presented one of the most important papers that has come before this Institute in many years. We have reached the time when, with the introduction of the four-year course, we should pay more attention to things which are not only of great assistance in our routine instruction in the various departments, but also of tremendous cultural value. The library and museum of an institution should be the hub around which practically all the activities of that institution should revolve. There should be a teaching connection between the library and museum, and every department of the institution. The library should be the place where the student will be attracted when he has no other definite assignment. It should be made so attractive that he will naturally drift there when he has leisure time.

The better classification and more intensive use of our dental literature in the school should develop a closer relationship between the dental student and the practitioner. We have not as a rule brought the student up to as definite a realization as we should of what he is going to meet and be up against when he gets out in practice. We have generally taught him one thing along one line. We have not given him the broader view. Our curriculum should be so planned that our senior students should do much of the thesis work. At stated intervals each student should present a brief theme or thesis covering a certain number of articles assigned to him. This should be read before the class, or a section of it, and discussed by other students.

The museum collection should not be in a room where we have to unlock the door when we take the student in to show it to him. It should be wide open and inviting. The collection should not be entirely confined to a stated room. In the operative technic room there should be an exhibit of the selected work of students for a number of years. In the prosthetic technic room, there should be a similar exhibit, many photomicrographs should be on exhibition in the histologic, pathologic and bacteriologic laboratories, etc. Every department should have exhibits which will create interest and help to instruct. We have a mouth hygiene exhibit showing the history and development of various forms of tooth-brushes, also the steps in their manufacture. Another exhibit is of scalers used for removing calculus, from the time when it required a large chisel and mallet down to the smaller and smaller scalers that have been employed thru the years. The gradual reduction in the sizes of scalers is an indication of the progress that has been made in teaching mouth hygiene. As people have taken better care of their teeth, the large scalers have fallen into disuse, because they were not needed.

Dr. Hoff referred to the value of keeping alive in our schools the memory of the work and of the men who have gone before us. I do not know whether they have it or not, but it would be fine if the Baltimore College of Dental Surgery had an exhibit commemorating the life and work of Harris and Hayden. Every school ought to have a collection representing the work of those men who were the pioneers in dentistry, and each individual school should have a collection for the men who helped to make for it a place in the sun. In our own institution, some time ago, one of the graduating classes presented the school with a bust of my father. The Alumni Association has decided to present, in June of this year, a bust of Dr. Koch.

Our students and alumni are glad to do these things.

H. E. Friesell, Pittsburgh.

I want to take this opportunity to compliment Dr. Hoff on his paper. It is certainly the best paper dealing with this subject that I have ever had the pleasure of reading or listening to. I also agree with Dr. Black that it is a very appropriate paper at this time. The library and museum have come to be recognized as one of the most important departments of a dental school. Certainly the essayist has given the matter exhaustive treatment and has presented many things in connection with a library and museum that the speaker in particular is glad to learn. At our school we have for twenty years past been attempting to build up a library and a museum, and we now have what might be called a potential one. Many of the suggestions that have been made by Dr. Hoff will certainly prove of value to us. We have had in view the ultimate value of this library and museum during all the years we have been attempting to collect material. However, when you visit our school tomorrow afternoon you will not see much of either library or museum. There is, in a small room available for the purpose, just a sample, but we have authorized the construction of a new building which will give us four times the floor space of the present one, and in that building we have provided space for a library and museum 40′x80′. This will indicate what we in Pittsburgh consider a library and museum worth in dental teaching.

We have had the good fortune to be assisted in this work by Dr. Wm. G. Holland, who is the Curator of the Carnegie Museum in this city. His interest in the work has been of much help to us in building up our library and museum. While you will see only a small portion of our collection, we have probably 300 dry goods boxes full of material and no place at present to put it. We are praying and hoping that the war will soon end, and when we have our new building we shall be able to make some adequate use of the collection which we have been building up.

The essayist states that a museum cannot be bought. If he can show me where one exists that is for sale I will prove to him that it can be bought.

Dr. Hoff has presented a plan upon which to lay out both of these departments. I agree with him that it is essential to devise some means of training students how to use the library, and I think we will have an excellent opportunity to do this in our course of dental rhetoric or English or whatever the individual school prefers to call it, and also that we can make much use of the library and do much of this training in connection with the course in dental history. Every teacher should give with each lecture or class recitation an assignment of reading to be carried out by the students covering that particular subject, and this might include older work as well as current literature. In this respect, one activity that the Institute has for several years had under consideration will come in very handy in connection with the library and its proper utilization, and that is the Dental Index Bureau. We started on that work about ten years ago and it is getting in pretty good shape, and by the time we in Pittsburgh have our library installed I trust that we may have a Dental Index so that real live use can be made of the library.

I also wish to speak of the value of a collection of anatomical and pathological specimens. This can serve as a very important adjunct to teaching in these departments, and we have been trying to do something of that kind here in Pittsburgh. Proper classification and arrangement of the specimens in a museum is just as important as is possession of the specimens, and I hope that some of us will be able to get in touch with men in the dental profession who are as much

interested in this work and as capable of serving in the capacity of librarian and of custodian of a museum, as is Dr. William Bebb, of Northwestern University. Very shortly the modern dental school will be unable to get along without a good library and a good museum, and there will be a place on every dental faculty for a man whose entire time will be devoted to building up the library and museum, and devising means of making them useful to the students and to the teachers.

E. H. Mauk, San Francisco.

I was particularly interested in what Dr. Hoff had to say about getting the value out of a library, and also what Dr. Black had to say about the plan which we have already put into effect in the University of California Dental School to help bring this about. As a result, I can truly say that for the past two years at least, we have gotten a fuller value out of our library than we were ever able to do before, tho the plan I am about to mention has been applied to only one phase of teaching dentistry, the subject of prosthesis.

Recognizing the fact that thruout the course of dental teaching, students became possessed of bits of knowledge which were more or less promiscuous, and in many cases not related in the student's mind, we wanted to devise a means whereby the student might pick up these loose ends. As the University regulations permit of a thesis being accepted in lieu of a final examination, after considerable thought we found that this could be applied very appropriately to stimulating the students use of the library, and give him a broader grasp of the subject than could be obtained thru an examination.

I think we will all admit that the ordinary examination, whether it be a mid-year, an ordinary quiz, or even a final examination, is more or less perfunctory. A student "crams" for it and usually speedily forgets what he has crammed. Therefore, I feel that the advantages of the plan I will outline here are obvious.

We divided the class into small groups, last year about five in a group, and assigned to each group a thesis topic on which each student must write. This list I will read.

It does not cover all aspects of dental teaching, but bear in mind that this is only one phase of dentistry, dental prosthesis, under which head we include both crown and bridge work and the so-called prosthetic dentistry, or plate denture making.

Subjects were assigned as follows:

Group No. 1. Clasps and special attachments having the function of clasps.

Group No. 2. Bar bridges.

Group No. 3. Inlay abutment bridges.

Group No. 4. Removable facings and teeth.

Group No. 5. Anatomical articulation.

Group No. 6. Compound vs. plaster impressions.

Group No. 7. Rubber and vulcanite, including obturators.

Group No. 8. Dowel crowns.

Group No. 9. Removable bridges.

Group No. 10. Casting, applied to dentistry.

In presenting these theses, the students are required to list all reading references and indicate them by numbers in the body of the text. Subjects were assigned for this year on Dec. 20th, 1917, and are to be presented on March 11th, 1918, the time available for preparation, therefore, being about ten weeks. There is considerable difference between that period of time and what is usually spent in preparation for the ordinary examination, for which one week or less is probably a big average.

The best thesis is selected out of each group, and the writer is required to read

it in class, at which time another group of students, previously assigned, discuss it, one at a time, in a formal discussion, criticising freely, or adding new points. Thus no student escapes without preparation on at least two subjects. He is marked not only on the general excellence of his own thesis, but also on his discussion of some other thesis to which he is assigned, and in addition, hears all the other theses read and discussed. From all this he is bound to absorb more than would be possible with a hurried examination and no opportunity for later inspection of the results or comment by others.

Further detail in regard to the manner of presenting the theses would probably not be of value here.

As an aid in their composition, the student is furnished with a list of subtopics with each theme, so that he gets a somewhat defined idea of what he is to write upon. He can select his own material in general, but must at least touch upon these sub-topics.

The interest that has been aroused in Dental Prosthesis in our school since this plan was put into effect is most gratifying. The meetings at which the papers are read are similar to dental society meetings and many of the papers are certainly worthy of being read at any dental society meeting. If a student plagiarizes, this act is usually exposed and critisized by the others. I know of nothing in my sixteen years of teaching that has afforded so much satisfaction as the outcome of this method, and the resultant use of the library. The discussions afford great interest and often provoke great amusement. We also consider these theses a valuable addition to our library, keeping them on file for the guidance of future students.

Alfred Owre, Minneapolis.

Referring to Dr. Mauk's discussion, we in Minneapolis have used the system outlined for about as many years.

In regard to Dr. Hoff's historic course and the use of the library, I would like to say that there again we are in danger of narrowness unless we associate these special historic events with the general movements of mankind. I know that Dr. Hoff is very fond of giving a course in the history of our men. That is, of course, of great cultural value, but unless it is related to the great historic movements of the world it loses something. For instance, the idealistic value of it is enhanced greatly by references, for instance, to the platonic ideal. That point we should bear in mind. It can be made use of most widely to connect up with a variety of cultural subjects.

Every course in the university, and especially our dental course, should have its reading matter. And that should be assigned to the student as the teacher outlines his course. There should be no excuse for a student not having this material at hand; having been instructed in the use of the library he should have no trouble in finding his data.

We use the term "museum" somewhat in an ambiguous sense also. I think Dr. Hoff has included in the term a great deal of teaching material, technical exhibits, etc. The museum should have in it things of cultural value, the created possessions of the past and present age, things that are really created. To that institution we should relegate such things, and to the exhibit of technical procedure we should have teaching material relegated.

J. H. Kennerly, St. Louis.

I am always interested in anything that pertains to a dental library. Any library is interesting to me, but as I spend practically all of my leisure time in working in a dental library it becomes very fascinating work. The only trouble is that the hours one has are so limited. As Dr. Hoff said, it seems nearly impossible to show that you have accomplished anything. It is tedious in a way and

long drawn out. However, we can see from year to year that something has been accomplished. What its value is in a teaching way I think cannot be estimated.

What I wish particularly to say is that in the storeroom of the library at Washington University Dental School we have about 10,000 surplus journals, and they are at the disposal of this organization or of the dental profession where they are needed by your asking for them and paying the freight on them. So that, as far as those journals are available you are welcome to them. They come to me from all sections of the Mississippi Valley because I have offered to pay the freight from any destination in that locality to the school on any number of journals a person will send. I do it for this reason: I have practically all the journals of the country complete to date, and the journals of the last year are in the hands of the binder. Within a very short time the journals for 1917 will be in the library, as are all those preceding. The surplus I store away, and while it is a good deal of trouble to hunt them up, I am always glad to do it because I believe that I am thereby doing some good for my profession.

In passing I simply want to remark on Dr. Mauk's plan of thesis writing. A few years ago in the city of St. Louis there was great rivalry between certain medical schools as to which one could secure the most appointments in the City Hospital on competitive examination. Finally in one of the schools a change was made in the faculty by the introduction of a number of new teachers. They immediately decided that they would hold no examinations, that they would depend entirely upon written theses, and they would grade and graduate a man according to the work he did in his thesis. The result was that they did this for only one year. At the close of the first year, when the examinations for appointment of internes to the City hospital were made, this school, which had formerly secured about 75-80 per cent of the appointments, did not get one. They claimed to have found the cause in the fact that no examinations had been held in the school and that consequently the student had not become accustomed to writing examination papers or answering questions. So they failed to get a single man into the City hospital. Since that time they hold more examinations than they ever did before.

Dr. Friesell: I ask one moment to add a little to my testimony. One reason why the University of Pittsburgh has placed the course in dental rhetoric in the third and fourth years is to enable us to make proper use of the dental library in the seminar system as explained by Dr. Mauk. The student does not have the preparation or time to do this earlier in the course, so we have passed it on to the third and fourth years.

Dr. Hoff: I am very sure from the comments that have been made by the gentlemen who have discussed this paper and cited instances wherein the use of the dental library and museum has proven of advantage in cultural as well as educative achievements, that if you had library facilities available such as I have tried to idealize in my paper you would find more illustrative material than you ever dreamed of and you would get a deeper interest in the work itself. In communicating your ideals to your students, you would find it easier and more delightful, and I am convinced your students would become more interested in the work.

The plan Dr. Mauk has outlined I have used in a little different way in my own work in attracting the interest of my students. My students during my absence are having a final examination along this line in which there has been assigned for each day a topic upon which they are to write an essay. And these topics will not allow them to utilize the

instructive forms in which my class work has been given; they will have to use their imaginations, their knowledge and skill in writing those topics. To those who are a little doubtful of your ability to accumulate library and museum material, I wish to say that if you will simply take this incident that Dr. Kennerly has given us wherein he has accumulated so much valuable material, and magnify the results of his efforts by those which have been accomplished by a dozen other schools in the country similarly situated, you will find that every college has more or less material it is not using and which will be very helpful and valuable in creating a library and museum collection. I am sure that when you once begin this work you will receive more help and encouragement than you anticipate, and that you will find the task less difficult and burdensome than you imagine.

I wish to take this occasion to recommend to you that you visit the Northwestern Dental School in Chicago for inspection of their museum and library, and you should go when Dr. Bebb is there. He has put a lot of work and time in the classification of the collection which comprises this museum, and in organizing it into a form which gives it an instructional value. In fact, he has crystallized the subject in a way there that I never have seen attempted anywhere else. I hope the Institute will meet in Chicago next year and that you all may have an opportunity to see that museum and meet Dr. Bebb. And incidentally, while writing this paper I have had this thought running in my mind: Why not have a man like Dr. Bebb visit all the schools in the country and help to institute libraries and museums in the proper way? There is nothing which the dental colleges of this country could do to better advantage than to secure the services of Dr. Bebb for the purpose of going to the different schools and organizing this department of our work. He would certainly do it better than any one I know, for he has the proper conception of what is needed and the experience to carry it thru, and he would do it profitably to every one. He could institute and organize this most important department so that it would become, if properly developed, a popular means of instruction. I have understood from Dr. Bebb that he possibly would retire from the profession before a great while and go to farming. It would be a great loss to dentistry to let him drop out of this important work. I do not know of any teacher in the country that we could spare with greater loss than that very man. If he could spend some time visiting and advising our college faculties, he would do invaluable work for us, and I trust that his talent may be sometime utilized in some such way.

THE STUDY CLUB.

By John V. Conzett, D. D. S., Dubuque, Iowa.

(Read before the National Dental Association at Its Twenty-Second Annual Session, Chicago, Ill., August 5-9, 1918.)

THE United States Government, by process of law, has recently placed Dentistry on the same professional basis as Medicine, and as a result of that action we now have that which we have so long desired—an equality in fact as well as in theory with our brethren of the older branch of the healing art, and a just recognition of our status as a profession.

But no Congress, Parliament or legislative body of any kind can maintain a parity between the professions of medicine and dentistry, or for that matter between any other professions. The status of any profession is determined by the ability and character of the individuals composing it and altho congress by process of law has given to dentistry certain rights in the Army and Navy and has in the intent of the law made no difference between them; if we are to maintain the proud position which has been given us as a recognition of professional worth and scientific attainment, we must prove our right to it and if we do not we will automatically lose that which has been given us. That can only be done in the present instance by recognizing some of our failures and shortcomings and earnestly striving to correct them.

In the building of a strong professional body two things are of paramount importance, first the proper preparation of a body of students who may enter upon the study of dentistry, and second the engendering in the minds of the men in the profession an enthusiasm for self-culture.

The first part of the problem has been met and partially solved by the Educational Council in insisting upon a four years' high school graduation certificate as a requisite to martriculation in any school of dentistry. But is that enough? Medicine requires in addition to that two years of college work. Is a boy that has only four years in a high school able to maintain a cultural parity with a man that has had the advantage of two additional years of study and opportunity in a college? All other things being equal, he cannot, and some men in the highest councils of our profession believe that we will soon have to come to a two years' college dental prerequisite, or we will have to drop our pretentions of professional equality. But interesting and profitable as this may be, we do not desire to discuss that phase of the subject.

The second point of necessity is the raising of the standard of the men in the profession in regard to their professional ability and inspiring within them an enthusiasm for a higher cultural and scientific attainment. There are several methods by which a man can advance in knowledge and culture. There are many so-called self-made men, men that have not had the advantages that have been given to their fellows, and yet, by reason of a hungering and thirsting after knowledge have burned the midnight oil, delved into the secrets of na-

ture unassisted by their fellows of higher attainments, and by heroic effort have made good in the eyes of the world. The man that we delight to honor as the first American was a man of that type, and how well he succeeded is demonstrated by the fact that his name is first in the history and love of his country. No American is so great that he cannot look up to Abraham Lincoln. Thus, many men in our beloved profession have and are making good by working, studying and experimenting in the seclusion of their own libraries and laboratories and coming out from thence and blessing the world by that which they have wrought. This is one way in which men can succeed, but it is not the easiest way. Another way that is open to all of us is the post-graduate course that is offered by the various colleges, and I wish to commend that method with all the force of my influence. I know of nothing better for a man in practice than to take a month or two every two or three years and obtain that which is offered in one of these excellent courses, but it is not every man that can do that. The expenses incident to the caring for a developing family are so great that few men in active practice feel that they can afford to leave long enough to obtain the benefit of such a course.

The various State dental societies have done yeoman's service in the past and are doing a still greater work today with the advanced methods of didactic and clinical instruction which the evolution of the dental society has given us. The wonderful advance that has been made by the profession of dentistry is almost wholly due to the influence of the dental society, and no encomium that I could bring her would be too great. Personally, I owe more to the influence of the Iowa State Dental Society for my professional advancement than any other factor in my life, and that which is true of me is true of almost every other man in the profession. But, as the dental society has developed, there has arisen an influence within it that has gathered the scattered superficial influences of that instrument for good and has concentrated them within one channel whereby their power has been made a hundred fold more potent and men have been enabled to more easily and more perfectly obtain that which they desired in the way of professional attainment. I refer to the Study Club.

The ideal study club is one which is composed of a small group of men drawn together with the desire to study the problems surrounding some special subject. The watchword of the modern study club is concentration—the forgetting of all things else and the doing of this one thing until it and the problems surrounding it are mastered. In our study clubs we have advised that they be not larger than twenty men and if possible even smaller than that. These men to choose their subject and then obtain the services of some man that is a master of it and under his direction and guidance study it in a practical and theoretical manner until it is mastered in all of its relations.

In this way clubs have been formed all over this country, and many of the best men in the profession, men that are recognized authorities in their various departments, have had their instruction and inspiration thru their association with their fellows in a study club.

If a group of men desire to study operative dentistry for example, they select the man that is their ideal and whose methods they wish to follow. Upon an appointed time these men come together, the demonstrator lectures to them upon the principles of the methods that he wishes to teach and then every man in the club is expected to operate upon a patient under the direction of the demonstrator. In this way the student learns the practical methods of operating as well as the theoretical, and stimulated by the presence and friendly criticism of his fellow students, he strives to put into the work his very best effort, and as a

result gains more in that manner than he could in any other way. We insist upon the practical going hand-in-hand with the theoretical, for we know that a man might go to club after club, listen to the lectures and witness the demonstrations, but if he does not do the real work himself, he will not have the interest and confidence in the subject to follow it out in his own practice. If a club can be formed in any city where there are enough men to constitute such an organization, it is advisable to have monthly or semi-monthly meetings either with or without the presence of the demonstrator, and have different men operate at each meeting and have the rest of the club criticise their efforts. This stimulates the operator to do his best and also whets the ability of the critic as he watches the operation looking for defects or departures from the teaching of the demonstrator. After the operation a meeting is held where all of the operations are candidly and fearlessly, yet kindly, criticised. At each succeeding meeting of the club at which the demonstrator is present, he carefully watches the progress that each operator has made and applauds or corrects as the case may require.

The demonstrator recommends the necessary books for study between sessions and conducts quizzes upon the work that he has outlined at the time of the next regular meeting. In this way a taste for study is engendered that will not cease with the completion of the club work.

The outline given for the conduct of a study club in operative dentistry can be followed out for most other branches of study. There will be clubs for the study of Prosthetics, Crown and Bridge Work, Root Canal treatment and filling, Orthodontia, Anesthesia, Pyorrhea and Prophylaxis, Pathology, or any other branch or sub-branch of our calling.

It would not be possible in the space allotted to a paper of this kind to give in detail the method of carrying on the work of each kind of club, the course of study, lectures, operations required or advice, etc., for that must be left largely with the demonstrator that is going to carry on the work. The one thing that we would very earnestly advise is to use care in the selection of the demonstrator —be sure that he is qualified to teach, and then submit absolutely to his guidance, for in the short time that a club meets the most must be obtained in the shortest time and if time is lost in meaningless disputes and differences of methods, nothing will be gained and much lost. If the demonstrator is competent, accept his method for the time at least even if you think that you have some better way for he has been engaged to teach his methods and if the club wants your methods, they will engage you. In the meantime accept the methods that are being taught and you will doubtless get more than you thought you would. The point is that so much time is lost in club meeting thru the efforts of some member trying to impress upon his fellows his own superior knowledge that we must insist upon all members of the club accepting the methods of the demonstrator or leaving the club.

The Study Club method of teaching and learning new and accepted methods of practice has become so valuable that it is becoming universal in its acceptance and the more it is followed the more it is appreciated, and no better thing could be accomplished by the National Dental Association than to appoint a committee whose duty it would be to stimulate the formation of clubs all over the country and help them in their organization by advice and the recommendation of competent men as instructors.

SUCCESS.

By E. Zimmerman, Minneapolis, Minn.

(Read in the Senior Class in the Conference Course in the Department of Theory and Practice, College of Dentistry, University of Minnesota.)

THERE is always a two fold aspect to everything; the theoretical and the practical, the ideal and the practice. Theory is the soul of practice, and practice advances only because of it. It is the game of life to find how close we may come to the ideal. Service in life is the ability to grasp a correct ideal, to recognize the opposition against it, and to remove the same. The more theoretical we become, the more practical are we.

Man is what he believes he is. He is a victim of incorrect, as well as correct suggestion since first the forces of nature manifested the habit of life. How can man make a success of material problems when he is a problem himself, when he has not found himself? That finding of yourself is personality. Personality is the primary basis of all success. Man becomes so from belief thru *correct suggestion.* Our greatest men are those who understand their own age and the next, and prepare the present to fulfill the future. A knowledge of the evil ideals of our present stage and of measures to fulfill the ideals of the future is our best starting point to a correct personality.

True success in any one branch is impossible without a correct knowledge of the principles of life, a knowledge making for that rich inner spirit of thought which rules the world thru a positive radiating belief as to right and wrong, which makes for contentment, satisfaction and happiness. One can make a camouflage success thru sheer drudgery to produce a result. *But to make the burden light; to make the game worth the candle,* to make it a joy, this is where personality means life. Because so few possess it we differentiate, and call it personality instead of true happiness. It is that spirit we are glad to shake hands with, to know and to worship.

Life is a manifestation of the forces in nature. The purpose of life is to function. He most truly lives who sees most, knows most, hears most and does most. Happiness is the functioning of your faculties by good means toward good ends. Why is this definition not used for personality? The difficulty lies only in knowing what the good means are and what the good ends are. Truly a wide open receptive mind that can read thru the pages of past experiences and make logical conclusions of the future is necessary. Only thus do we grow strong.

Thru the process of ages man, thru suggestion, has become a mixture of strange beliefs, impulses, fetishes, prejudices and superstitions and has been left a more or less disjointed machine which Nature, in her slow sure way, attempts to adapt herself to, with varied success. Our very lives are machine-like and regulated by the clock. We are educated in a huge educational machine, adjusting the child to a specifically defined course. Unless a child is unusually wary, he soon ceases to question and accepts the teacher's suggestions mechanically. The child who is promoted is the child who can repeat by rote what the teacher has told. He has learned good ideas in that way, but he has killed his thought-

power, since he has become a suggestion-machine. Our minds have been trained to master other than our own. It is astonishing to note the vague, hypnotic way we have of letting the other fellow do the thinking, of grasping at the easiest way, and with misrepresented creeds believing all, so that no further real progress is necessary. We follow the crowds like cattle. A belittled mind in a submerged area is more difficult to raise than an ankylosed molar. We are all apt to look upon ideas which do not coincide with our beliefs as either foolish or crazy. Let him who believes one creed or set of ideas go out on a bright sun-shiny morning and walk until the thoughts begin to come and he will get a very different story.

Too often do we, especially in America, ascribe success to material things in direct proportion to wealth, while the ideals, beauty, literature and the arts must suffer. That poorly described something which has made man rich in spirit and free in mind is worth more than fabulous wealth. A man can always make money, but can he as easily free his spirit? When a system, thru the tawdry teachings of a modern world, gives license to an individual to accumulate an excess of money power it is doing his fellow creatures an irretrievable harm. Such individuals become fat on the wrongs and ignorance of others, and their lives can bespeak only of a superb selfishness. Yet this is one of our finest examples of success. It has become a commonly used phrase to say, "Every man has his price." Man is man's most potent enemy to advancement. Our Union Painless Dentist man of business fame is a lesser example of a small life. He may be deceiving his fellow creatures, but he can not help blunting and rotting himself.

A chance of ideals is necessary. The gospel of Mammonism must give way to the gospel of freedom without license. which again will give way to the final gospel of service in proportion to the active thinking done by the masses. Thru the process of ages, the World War is at present at the apex of such a change. None have excelled the German mind in devising machine-like efficiency toward material success, yet millions of men are willing to give their life's blood to oppose it, not for wealth nor for material gain, but just for ideals which all the world is craving.

We now know that ideals are absolutely essential to a true success and are in reality necessary for its true foundation. It is now necessary to make them as practical as possible. When is a thing an ideal, and when is it a wrong? An ideal is beauty. An ideal is perfection. Goodness, beauty, perfection and ideals are one and the same thing. Where you recognize beauty, there lies your true success. This law is very positive. It is our express duty to recognize the beautiful in a thing before we undertake it. Many people have eyes but do not see; many have minds but do not think, yet an even balance of our senses are necessary to recognize true beauty. Work without it is drudgery; work with it is joy. *The game of life which has made men happy is to perfect the old and to create beauty in the new.* Beauty is that quality within ourselves which we recognize without us. Self-forgetfulness of one's self in the beautiful—it is that same sublime losing of one's self in the higher consciousness which we find in all lofty effort, whether in art, in oratory, or in literature. Shakespeare, Raphael, Webster, all have possessed that spirit.

Yet, one will say, how impractical; how theoretical. I am not built that way, nor does the world permit of the time or thought. Yet by that same process with which you have become a sordid machinery of belief which has rendered you immune to beauty—by that same process does one free himself of all the shackles and trammels of misrepresented ideals. That is to say, by the power of suggestion we beget belief;

thru belief we beget habit, and life is but a number of habits—a simple analytical problem.

Man is what he believes he is. You will never win the battle of life if you do not believe you will win. Radiate the spirit of confidence, fearlessness, success; and thru this suggestion it becomes a belief, which belief soon becomes a habit. Your thoughts are success, your subjective mind with its perfect memory takes it up and you can not but act and think and do in terms of success. You are not fooling yourself. There is nothing that succeeds like success. Don't tolerate a failure. The successful man in every profession in all departments of life are enthusiasts, expressed or inexpressed, whether it be Edison, Burbank, Carrel, Hartzell or Billy Sunday. It is the basis of all the good in Psychotherapy, faith healing, Christian Science, etc., and is based on the principle of Monism, the unity of spirit, mind and body. Saturate your mind with a continual repetition of conditions antagonistic to your weaknesses and as magic the condition you wish will come to pass and exist in reality.

Will acts primarily thru belief and suggestion. A free play of will can never exist with the presence of fear. Fear can be ignorance only, and fear disrupts our reason and balance. Creeds that teach fear are a powerful bar in the paths of advancement. Fear of death is the greatest fetishness of them all, assimilated thru the perverse teachings of bigoted minds to whom liberality means downfall. Money may be the root of all material evil, but fear is the root of all spiritual evil. Judge which is the greater. Never worry. Do what you can, and what you are not able to do, you logically can not do. Fear of the future gives rise to ambition for wealth and power, an idea to be avoided at all costs. We do not ask much of life if we are inwardly spiritually rich. Socrates, on seeing many luxuries spread before him gave rise to the thought, "How much in life there is I do not want."

In conclusion it may be said that success lies in the ability to see the beautiful, to perfect the old and to create the new. As life is action, as life is motion, so is work a God-send. The individual who creates the beautiful in thought, spirit, action, in his profession is the man who makes his mark. There is only a good living in Dentistry. See to it that the work itself is a pleasure. Don't let the hurry scurry of this modern world turn you into a nervous machine. A machine may be efficient, but it has no soul and you have. If you die before your task is finished, don't worry. There are men left who are quite able to finish it. Take all your work as a game. Play the game for the game's sake. Be confident and fearless, but moderate and tolerant. When your blessing infringes upon the rights of others, it is no longer a blessing. In this world there is no room for passions. Passions are remnants of what we used to be, or are intoxicated senses which are developed at the cost of the rest of our faculties. It is a rule with a sportsman, when a hard trail is foreseen, "to go light." We may also put that practice to good use. If you have any respect for your own body and mind eat a minimum not in excess. Egotism is a fault of all of us. Remember that independence is a scarce article, that we are physically and mentally dependent upon the rest of our fellow creatures. Each has a message to bring. *Absorb the beautiful, radiate the result and watch the effect.* It cannot be anything else than true success. Rejuvenate yourself with the new, we are all liable to stagnation! Browning has it when you perfect even some small work of service:

"All I could not be,
All, men ignored in me,
This, I was worth to God
Whose wheel the pitcher shaped."

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INFORMATION TO DATE ON INFECTIONS WITHIN THE ROOT AND PERIAPICAL TISSUES.

By K. R. Collins, M.D., Cleveland, Ohio.

(From the Laboratories of the Research Institute of the National Dental Association, Cleveland, Ohio.)

(Read before the National Dental Association at Its Twenty-Second Annual Session, Chicago, Ill., August 5-9, 1918.)

IN THIS paper the author has made an attempt to present a review of the literature pertaining to the subject. It would not only be cumbersome but impracticable to take up each individual report on pyorrhea and periapical infections. An effort has been made, however, to cover the various opinions as completely as the short time available for the study of the subject permits. Hence, if there are any important views not brought forward, the omission has not been intentional.

It has not been found possible to differentiate between pyorrhea and periapical conditions, as with many authors the term "pyorrhea" includes not only marginal but apical infections as well.

I have tried to avoid such articles as have appeared in the Dental Journals from time to time with which you are probably familiar. This has not been consistently possible at all times, so on account of the importance of the papers I trust you will bear with the repetition.

According to Black's "Index to Dental Literature," articles appeared in the Dental News Letter on Alveolar Exostosis (1) as early as 1848 and in 1858 in the same journal mention was called to the relation of dyspepsia, rheumatism and gout to abnormal states of the teeth and neighboring organs (2). Since that time much has been written upon this subject and considerable experimental work has been done in an attempt to solve the problems involved in these conditions.

For the sake of clarity this review is divided into the following subjects:

1. Etiology of periapical infections.

2. Mode of invasion.

3. Relation to systemic diseases of these infections.

4. Opinions as to the various causes of such diseases as seem related to the root and periapical tissues.

5. Immunology.

Etiology. Among the various agents which have been looked upon as the cause of pyorrhea, the Entameba Buccalis may be considered first.

Since 1849 observers have considered that this organism bears a casual relation to infections of the periapical tissues.

Smith, Middleton & Barrett (3) in 1914, and at the same time Bass & Johns, (4) after a study including more than 300 cases of pyorrhea dentalis and alveolaris, announced this organism as the primary cause.

Williams and von Sholly (5) examined smears from 995 representative cases among school children between the ages of 5 and 16 years. The cases were divided into those with healthy gums, those with decayed teeth, those with tartar and receding gums and those with spongy and bleeding gums. In children between the ages of 5 and 7, the Entameba was found in 9% of cases of healthy gums, increasing up to 70% in spongy and bleeding gums. In children from 7 to 16 years of age, the normal gums showed 29% and the spongy and bleeding gums 91%.

This shows an increase of Entameba in diseased gums over normal gums. The increase that occurs with age might well be due to the fact that children under seven are usually cared for by an older person, while children over are more independent and liable to be careless in the care of the mouth.

William's tables controvert Bass & John's opinion that the Entameba are not found in healthy mouths. She also states that as ameba absorb and digest fixed tissues as well as leucocytic blood cells and other wandering cells, they may well help decidedly in keeping up a lesion bacteria have started without being the primary cause.

Price & Bensing (6) quote cases of pyorrhea alveolaris where the Entameba is not present.

Hartzell & Henrici (7) have been unable to confirm Bass & John's work on the Entameba.

The second factor to be considered in the Etiology of Peridental Infections is the role of bacteria as an exciting cause.

Gilmer & Moody (8) have found the predominating organism to be a streptococcus.

Rosenow (9) in smears from pus from the roots of diseased teeth found gram positive diplococci, diphtheroid bacilli and a gram negative bacillus.

The diplococcus inoculated into animals gave in ten, circumscribed hemorrhage and edema opposite the roots of the teeth or at the foramina of exit of the superior and inferior maxillary nerves. In seven there were lesions of the muscles of the left side of the neck, in six, lesions in the pulp of the teeth and the superior or inferior dental nerves, in three, insignificant lesions of the kidney, and in two, lesions of the gall bladder and one in the stomach. The diphtheroid bacillus did not produce lesions in the one rabbit and mouse injected.

Hartzell & Henrici (10), referring to the streptococcus viridans, state that it is not proven certainly that this organism is the etiological factor in pyorrhea tho the evidence is slowly accumulating which in the end may be accepted as proof sufficient to justify our believing it to be the specific factor. They found streptococci in 150 out of 162 cases of pyorrhea alveolaris.

Krumwiede & Pratt (11) found mixed cultures present constantly in smears from pyorrhea alveolaris and periapical abscesses, and conclude that it is not necessary for these localized infections to have a distinct flora but may depend upon the flora of the mouth.

They found in 24 cases, where extraction was ideal, the cultures obtained from the root cavity contained streptococci and a diphtheroid bacillus. The streptococci proved to be various strains and groups, one case showing 9 strains and four groups. One case of endocarditis gave 11 strains of streptococci.

Bowman (12) reports finding in a number of cases of troops with ulcero membranous stomatitis and gingivitis the Vincent Bacillus and spirochaete predominating, at times almost a pure culture in pyorrhea where no other concomitant affection of the oral mucous membrane was present.

Taylor & McKinstry (13) found the same conditions among troops with similar conditions of throat and mouth.

Dental surgeons are finding trench gingivitis common in French and British troops.

Miller (14) believes that pyorrhea alveolaris is not caused by any specific microorganism but various bacteria may participate in it just as in other suppurative processes where many species may be found.

Mode of Invasion, Secondary or Primary.—Very little is written on this subject relating to pyorrhea. Hartzell & Henrici are of the opinion that peridental inflammations are primary lesions, the organisms gaining access to the tissues either thru the pulp canal or at the gingival margin and not secondary to other foci.

Krumwiede (15) believes the majority of cases of alveolar abscesses are of hematogenous origin. This is in line with Rosenow's results where he produced pulpitis by intravenous injections of streptococcus viridans.

Cummings (16), in a series of 291 cases of measles among soldiers at Fort Sam Houston, where a hemolytic streptococcus was constantly present, found among the various secondary localized infections one case of abscess of the gum.

The Relation of Systemic Diseases of infectious origin to peridental infections has attracted a great deal of attention from the Dental as well as the Medical profession.

Hartzell & Henrici (17) tabulate a number of cases of chronic arthritis, chronic rheumatism, endocarditis, nephritis, arteriosclerosis, peptic ulcers, secondary anemia, pernicious anemia and neuritis associated with pyorrhea, a fair percentage of these cases showing marked improvement or complete recovery after removal of the offending teeth.

Goldberg (18) reports a case of arthritis where the radiograph showed abscesses of the teeth, microscopic examination of the pus from the abscesses showed streptococci, diplococci, staphylococci and other organisms. The streptococcus viridans grew on blood agar. After treatment of abscessed teeth the arthritis disappeared.

In a report from the Kitchener Indian Hospital (19) on pyorrhea in Indians, the authors state, while there seemed to be an association between pyorrhea and rheumatism, it was necessary to point out that a streptococcus has not yet been proven to be the cause of either disease.

Also there was little evidence from their figures of a connection between such constitutional states as gastro-intestinal disturbances and pyorrhea.

They found greater preservation of teeth among the Indians than the European orderlies.

Roberts (20) considers the subacute forms of infections of the bones and joints the result of localized infections elsewhere in the body, the teeth and the tonsils being the prominent portals of entry and adds that we are apt to regard as the source of infection those points which are most accessible as the most probable.

Culver, Herrold & Phifer (21), in a series of 36 cases with concomitant lesions outside of the renal tract, cite

one case of alveolar abscess as the possible source of infection. They do not give the organisms from the abscess but found staphylococci, streptococci and typhoid bacilli in the renal lesion.

Lewis (22) reports a case of recurrent retinal hemorrhage where the roentgenograms revealed pyorrhea and apical abscesses. Hemorrhage was checked after the foci of the infection were removed.

Baude (23) insists that with large glands of the neck the primary lesion should be sought in the teeth before attributing the condition to a tuberculous process.

The various generally accepted causes of such diseases as seem related to localized infections within and about the teeth.

As there are a number of systemic conditions which seem to be of an infectious nature and thought by some to be secondary to root and apical infections, it might be of interest to consider some of the other sources of infection possible in these instances.

Rheumatism: Beattie (24) in 1912-13 found a micrococcus present in the joints of rheumatic (or arthritic) cases He considered this micrococcus to be the etiological factor in this disease.

The gonococcus as the frequent cause of rheumatism is cited by many authors and text books.

Levin (25) reports a case of pneumococcus arthritis without a history of pneumonia, but the patient had gonorrhea twenty years previously. He also quotes Herrick as having collected only 52 cases in literature with the pneumococcus as an invading organism.

Dick (26) isolated the Bacillus mucosus of Friedlander from the case of tonsillitis which when inoculated into rabbits and dogs, produced joint lesions, while streptococci isolated from the same case failed to bring about any lesions.

Tricoire (27) in a review of literature on localized and general infections due to the Enterococcus calls attention to the fact of the necessity of considering this organism as being some times the cause of acute articular rheumatism.

Kreuscher (28) in a clinical and experimental study of metastatic arthritides presents some very interesting results. He believes that metastasis does not take place unless there is a mixed infection or a secondary infection superimposed upon a primary one. A metastasis from a streptococcus pyorrhea alveolaris did not usually take place until a foreign streptococcus was superimposed upon a primary one.

Experimentally he found that a guinea pig did not ordinarily show metastases in distal organs, even after large quantities of microorganisms were injected directly into the heart, but if the injections were preceded or followed by organisms of another strain, metastases occurred in liver, kidneys, endocardium and joints. Rabbits injected with staphylococcus or other pathogenic organisms and then with streptococci, showed rapid and multiple joint infections in 90% of cases.

The following table gives the frequency with which the various localized infections occurred as a primary cause in metastatic arthritis:

TABLE I.

Percentage of the Various Localized Infections Occurring in 849 Cases of Metastatic Arthritides.

Localized Infections	Per Cent
Tonsils	25.5%
Teeth	18 "
Urethra	17 "
Sinuses	17 "
Lungs and bronchi	5 "
Bladder	4 "
Kidney pelvis	4 "
Appendix	2 "
Gall bladder	2 "
Furunculosis	6 "
Typhoid fever	6 "
Scarlet fever	6 "
Tetanus	6 "
Dysentery	6 "

Table II gives the frequency with which the various organisms were found in the joint lesions alone or in combination with one or more different types of organisms:

TABLE II.

Organisms Found in the Joint Lesions.

Organism	Per Cent
Streptococcus	31 %
Gonococcus	14 "
Staphylococcus	8 "
Colon Bacillus	4 "
Combination of two or more	38 "

Kreuscher, P. H., New York Medical Record Vol. 90, p. 834.

McCallum (29) in the 1918 edition of his text book on Pathology refers to the unknown infective agent of rheumatism.

Analysis of endocarditis of bacterial origin follows very much the same line as other secondary infections.

Osler (30) gives as the common sources of infection gonorrhea, abscess of the prostate, chronic cystitis, suppurative processes of the liver, many cases due to infected tonsils and thinks it is rarely caused by pyorrhea alveolaris.

McCallum (31) states that while many organisms can produce endocardial lesions, the chief ones are streptococcus, staphylococcus aureus, pneumococcus, the bacillus of influenza has been found, also various other organisms in single cases, as, B. diphtheriae, B. typhosus, B. coli. These he considers as probably secondary invaders.

He also states that endocarditis produced by S. viridans, the gonococcus and the unknown agent of rheumatism are of slow course and distinct from an endocarditis caused by the streptococcus hemolytica, the streptococcus mucosus and the staphylococcus which are of rapid course.

Claude (32) reports a case of slow endocarditis where the symptoms were predominantly nervous, chorea, hemiplegia and alternate facial paralysis; autopsy showed fine chained streptococci in the lesions of the mitral valve and foci of infectious arteritis.

Benson (33) cites a case of endocarditis and arthritis, complicating a gonococcal urethritis, the gonococcus being found in the heart's blood after death.

Cholecystitis and *cholelithiasis* are also quite characteristic of localized infections elsewhere in the body.

Dean (34) found the most important organism associated with cholelithiasis to be the B. typhosus, the other organisms occurring with less frequency, the B. pyocyaneus, B. coli, B. influenza, streptococcus, staphylococcus, pneumococcus, a capsule bacillus and some anaerobes.

The B. coli appears with considerable frequency but Blumenthal claims that it is probably a secondary invader, the other organisms having died out.

Rosenow (35) considers the streptococcus the chief cause in cholecystitis, finding them pure and in combination in the greater number of cases, but also found colon pure and in combination and diphtheriod bacilli quite frequently.

Feldman (36), in a study covering a period of eight and one-half years, found in cases of inflammation of the gall bladder the B. typhosus to be present with the greatest frequency, B. Coli next and the streptococcus only in combination.

The work of Bacmeister and Gilbert (37) is of interest in this connection as many investigators have considered the presence of an organism in the center of gallstones as being proof positive that it was the etiological factor.

Bacmeister, however, has proved experimentally that secondary invasion of the calculi can take place in calcium cholesterine stones, while Gilbert proved the same for porous cholesterine stones.

The recent work of Detweiler (38) is of considerable interest in connection with the subject of pyorrhea alveolaris and related systemic diseases. He used in his experiments only the various

strains of streptococcus viridans, isolated from infections localized in different parts of the body.

Several strains from each case being used, rabbits were inoculated with direct cultures with the results given in Table III:

Hastings (39) was able to differentiate arthritis due to streptococcus viridans from arthritis due to the gonococcus by complement fixation.

Potter, McNeil & Bradbury (40) after a series of tests in which streptococcic antigen was used, concluded as follows:

TABLE III.

Results Obtained from Inoculating Rabbits with Different Strains of Streptococci from four Different Sources.

	Organisms Obtained from the Appendix.	Organisms Obtained from the Gall Bladder.	Organisms Obtained from the Tonsil.	Organisms Obtained from Tooth Abscesses and Pyorrhea.
Organ	Direct Cultures. Per Cent.	Direct Cultures. Per Cent.	Direct Cultures. Per Cent.	Direct Cultures. Per Cent.
Brain		15	11	
Meninges				
Spinal Cord				
Myocardium	21	38	22	46
Endocardium	14	31	33	54
Pericardium			11	
Lung	14	15	11	
Pleura				
Diaphragm	7			8
Thymus			22	15
Stomach	29	31	33	15
Duodenum	21			
Gall Bladder		8		
Liver	7	8		31
Intestine				15
Appendix	14		22	38
Kidney		8		38
Muscles	14		11	
Joints	36	46	11	15
Periosteum				8
Skin				
Peritoneum				
Aorta				

H. K. Detweiler and H. B. Maitland, Journal of Experimental Medicine, Vol. XXVII, No. 1, 1918.

Immunology. Some work has been done along immunological lines in connection with alveolar abscess. The best results seem to be obtained by application of the complement fixation test.

"That even with imperfect antigen the results of the complement fixation test for streptococci in oral sepsis, complicating or causing many forms of chronic invalidism, supports in general

the clinical evidence of the etiological prophylactic and therapeutic importance of this organism and emphasizes the desirability of further attempts along this line to assist diagnosis."

INFORMATION TO DATE ON INFECTIONS WITHIN THE ROOT AND PERIAPICAL TISSUES.

Bibliography.

1. Dental News Letter, 1848-49, Vol. 2, page 46.
2. Dental News Letter, 1858-59, Vol. 12, pages 295-301.
3. Smith, Middleton and Barrett, Journal of the American Medical Assn., 1914, Vol. 63, No. 20, page 1746.
4. Bass and Johns, Journal of American Medical Assn., 1915, Vol. 64, No. 7, page 553.
5. Williams and von Sholly, Collected Studies of Bureau of Laboratories, Health Department, New York City, 1914-15, Vol. 8, page 405.
6. Price and Bensing, Journal of the National Dental Association, 1915, Vol. 2, No. 2, page 143.
7. Hartzell and Henrici, Journal of the National Dental Association, 1915, Vol. 2, No. 4, page 333.
8. Gilmer and Moody, Journal American Medical Association, 1914, Vol. 63, page 2023.
9. Rosenow, Journal of Immunology, 1916, Vol. 1, No. 4, page 363.
10. Hartzell and Henrici, Journal of the National Dental Association, 1915, Vol. 2, No. 2, page 130.
11. Krumwiede and Pratt, Collected Studies of Bureau of Laboratories, Health Department, New York City, 1914, Vol. 8, page 166.
12. Bowman, Proceedings Royal Society, London, 1915-16, Medical Section, No. 9, page 51.
13. Taylor and McKinstry, Proceedings Royal Society, London, 1916-17, Odontological Section, Vol. 10, page 8.
14. Miller, Microorganisms of the Human Mouth, page 333.
15. Krumwiede and Pratt, Collected Studies of Bureau of Laboratories, Health Department, New York City, 1914, Vol. 8, page 166.
16. Cummings, Spruit and Lynch, Journal of the American Medical Assn., 1918, Vol. 70, No. 15, page 1066.
17. Hartzell and Henrici, Journal of the National Dental Association, 1915, Vol. 2, No. 4, page 333.
18. Goldberg, New York Medical Record, Vol. 91, No. 5, page 185.
19. Report from Kitchener, Indian Hospital, Brighton, Indian Journal of Medical Research, Calcutta, 1915-16, Vol. 3-4, page 742.
20. Roberts, New York Medical Record, Vol. 149, page 1275.
21. Culver, Herrold and Phifer, Journal of American Medical Association, 1918, Vol. 70, No. 20, page 1444.
22. Lewis, Journal American Medical Association, 1918, Vol. 70, No. 24, page 1813.
23. Baude, Paris Medical, 1918, Vol. 8, No. 10, page 199.
24. Beattie, Journal Pathology and Bacteriology, 1912-13, Vol. 17, page 538.
25. Levin, New Orleans Medical and Surgical Journal, 1915, Vol. 68, page 794.
26. Dick, Journal Infectious Diseases, 1914, Vol. 14, No. 1, page 176.
27. Tricoire, Progres Medic, Paris, 1917, Vol. 32, No. 46, page 391.
28. Kreuscher, New York Medical Record, 1916, Vol. 90, page 834.
29. McCallum, Text Book on Pathology, 487.
30. Osler, Practice of Medicine, Vol. 4, page 133.
31. McCallum, Text Book on Pathology, page 235, 744.
32. Claude, Bulletin de l'Academie de med., Paris, 1918, Vol. 79, No. 10, p. 211.
33. Benson, Journal of American Medical Association, 1918, Vol. 70, No. 21, page 1524.
34. Dean, Journal of Hygiene, Vol. 12, page 259.
35. Rosenow, Journal of Infectious Diseases, 1916, Vol. 19, No. 4, page 527.
36. Feldman, Wien, Kli'n. Woch 28 Jahrgang, 1915, No. 48, page 1305.
37. Bacmeister and Gilbert (quoted) from Dean, Journal of Hygiene, Vol. 12, page 259.
38. Detweiler and Maitland, Journal of Experimental Medicine, 1918, Vol. 27, No. 1, page 37.
39. Hastings, Journal of Experimental Medicine, 1914, Vol. 20, page 72.
40. Potter, McNeil and Bradbury, New York Medical Record, 1918, Vol. 93, No. 4, page 135.

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VOL. 6 FEBRUARY, 1919 No. 2

Editorial Department.

DENTAL RESERVE CORPS COMMISSIONS TO BE GRANTED ENLISTED DENTISTS.

The editor, having received so many inquiries as to whether or not the enlisted dentists who completed applications for commission previous to November 11th, 1918, would receive dental commissions, and appeals to assist enlisted dentists to be immediately relieved from military service, has secured full information from those in authority, which makes it possible to give an intelligent record of the facts that have

entered into the various phases of the subject; therefore, we propose to discuss in this editorial the following propositions:

First, how it became possible for the enlisted dentists to complete applications for commissions.

Second, why, after having been granted the opportunity to complete such applications they were not granted commissions.

Third, that enlisted dentists are indebted to the War Department for the regulation which more than doubled the quota of dental officers instead of to Congress.

Fourth, to present certain needed information explaining why it is that the enlisted dentists were not receiving their discharge from military service as rapidly as they wished to be relieved from military duties.

To have a comprehensive understanding of the entire situation, it is necessary to consider the status of the Dental Service as it existed, not only when the armistice was signed, but on September 30, 1918, for it was on that date that the Adjutant General, by regulation, increased the number of Dental Officers for assignment by July 1, 1919, to 9200 for an Army of four and a half millions. Attention is called to the fact that a law was not enacted by Congress for increasing the quota from one to two per thousand in the United States Army, but the number of dental officers was increased to a number that relatively equaled two per thousand by regulation.

As is known by most of the members in the profession, efforts have been made to have the quota of two per thousand authorized by law ever since dentists have sought entrance as officers in the United States Army, but always without avail, and yet, here we find, upon recommendation of the Surgeon General's Office, the Adjutant General approved the assignment of a few over the quota of two per thousand.

This improved condition was brought about because dentistry in the posts, training camps and hospitals in this country, base and evacuation hospitals and in the field service far forward in the line, had proven its worth under the trying conditions existing in the present war. The authorization for the assignment of what amounted to two dental officers per thousand was secured on September 30th, and on October 3rd examinations were being held in every camp in this country and aboard for enlisted dentists.

A few days later authority was granted to each dentist who had been placed in Class 1-A by his Local Board to complete an application for commission in the Dental Corps of the United States Army. Between the 3rd day of October and the 11th day of November, a few over

fifteen hundred applications were completed and forwarded to the Surgeon General's Office. Between eight and nine hundred of these had been acted upon by the Surgeon General and were recommended to the Adjutant General for commission, and of that number, only about one hundred were granted commissions by the Adjutant General on the day the armistice was signed.

That the dentists placed in Class 1-A by their Local Boards and enlisted dentists in camps did not receive their commissions, as planned, has caused a certain amount of criticism, because the enlisted dentist in camp did not know or consider the facts. The explanation follows:

On October 6, 1917, a clause attached to a Dental Bill gave to the dental students the same rights heretofore granted by the Provost Marshal General's Office to be treated similarly to medical students that they might complete their education before being called to military service. This clause passed the Senate of the United States unknown to any dentist in this country, because it had the approval of certain important divisions of the War Department.

We have had a great number of inquiries discussing the desirability of enlisted dentists to be immediately relieved from military duty, and from our investigation of the subject, we learned that in the first thirty days after the signing of the armistice, that altho not one-fifth of the army was demobilized, four-fifths of the enlisted dentists were discharged from military duty, and that on December 19th, 1918, an order from the Adjutant General's Office was sent to all commanders, stating that all "graduate physicians, dentists and veterinarians who are serving as enlisted men in the Medical Department, Sanitary Corps and Veterinary Corps, would be discharged upon their own application if eligible, in accordance with the existing orders and regulations governing demobilization, for the reason that the services of such men are no longer required." This we are informed the Adjutant General's Office has interpreted to mean that any dentist who is not enlisted in the regular army is eligible for immediate discharge upon his own request. The Editor, therefore, takes the liberty of suggesting that if any enlisted dentist finds difficulty in being relieved from military duty, he should express his desire for immediate discharge and forward his name and station to either the Surgeon General's or Adjutant General's Office. If it is not practicable for the enlisted dentist to do this himself, it could be supplied by an associate, or a member of his family.

So, about ninety per cent of the enlisted dentists giving military

service on November 11th are indebted to the War Department for being permitted to complete their dental education instead of being drafted the same as students of all other University departments, with the exception of medicine. They are indebted to the War Department for not being called after their graduation in June, 1918, until a date subsequent to the time when the various State Boards would meet, that they might secure a state license before entering military service, so that if it became possible on a subsequent date to secure authority for these dentists to make applications for commissions, they would not be barred by the fact that they were not licensed practitioners.

These same enlisted dentists are indebted to the War Department and not to Congress, as many believe, for the regulation which doubled the quota of dental officers assigned to each thousand.

After having learned all the above facts, the Editor has come to the conclusion that it is evidently lack of understanding of the above facts that has resulted in so many of the enlisted dentists concluding that it was thru some neglect or lack of personal interest that the examinations authorized on October 3rd for fifteen hundred enlisted dentists were not completed in camp, forwarded to the War Department, acted upon by the various Bureaus and Commissions and returned to them previous to the 9th day of November—the date specified in the executive order of the Secretary of War, that all promotions and commissions should cease to be acted upon, regardless of what department had granted the application.

This full discussion has been presented to the members of the profession, because we believe that the enlisted dentists of this country have much to be congratulated upon and nothing upon which they can base a just criticism. All these enlisted dentists, who wish to do so, are now being permitted to receive a commission in the Dental Corps, inactive status, providing the application was inaugurated previous to November 11th. Each day the Adjutant General is issuing commissions to these men. Should these commissions be not received, it is suggested that such men address an inquiry to the Commissioned Personnel Branch of the General Staff, for that Department has full jurisdiction in this question; the Surgeon General's Office only disapproves or recommends favorably upon applications received.

A very few have failed to send their check for the Christmas stamps. Have you?

THE DENTAL PROFESSION'S TEN AIMS FOR 1919.

1. 27,000 members and 32,000 subscribers to The Journal.—Fifteen per cent increase in membership in every state society.

2. $75,000 in the Relief Fund.—Debt on the Research Institute building paid. —The foundation for a great National Dental Association Library laid.

3. 3,000 members in attendance at New Orleans meeting.

4. Due respect and honor for members of the dental profession who have served their country during the war.

5. Permanent Army and Navy Dental Schools established.

6. Systematic and standardized graduate and post-graduate courses inaugurated and developed.—The educational standard in every dental school raised.—The classification of State Dental Examining Boards.

7. More efficient dental service to humanity and better plans for educating the public.

8. Less of the spectacular and more of the scientific.—Greater thrift and a better educating individual dentist.

9. The three requisites for the successful dentist: Enthusiasm, Energy and Thoroness.

10. For every dentist to have a religion of truth, law, justice, work, democracy, mercy, monogamy, science, and God.

CONTINUE TO "CARRY ON" THE SPIRIT OF THRIFT AND SAVING

Our Government, thru its Treasury Department, is going to carry on the campaign of THRIFT thru War Savings Societies during the year 1919.

It has been found necessary since the signing of the armistice to start all over again the propaganda of THRIFT and SAVING. The great majority of the American people have forgotten the War. It is as if they had awakened from a long, bad dream.

This condition is unfortunate, because it means that as a people we have gone back to our old, thoughtless, extravagant method of living, and the return to that condition can be no more clearly demonstrated than by the wild, reckless purchases made during the holidays.

Upon the leaders of our social life, and every dentist should be a leader, falls the burden of example which will bring back the spirit of THRIFT and SAVING of War times. So, we urge that every dentist pledge to purchase $1,000 maturity value War Savings Stamps during the year 1919. Those who are unable to make a maximum pledge should

pledge to the limit of their financial ability, and thus loyally and patriotically co-operate with the Government in this great campaign of THRIFT and SAVING.

Your example will greatly assist the Government in creating that spirit of THRIFT and SAVING which was so apparent during the War period, but which now has been so largely forgotten.

Some dentists may justly plead that they cannot afford to make a maximum pledge. However, the editor is personally acquainted with a large number of dentists who will not be doing their patriotic duty unless they make a maximum contribution to this patriotic appeal of the Government for THRIFT and SAVING. There are other dentists who would manifest a keener business insight into financial investments if they were to invest their funds in War Savings Stamps and Liberty Bonds instead of making investments in oil stocks and "get-rich-quick" schemes.

THRIFT in every community is a necessity for stability and prosperity. The task of creating THRIFT is more greatly ours because of our predominant station in our social life.

We are confident that in this patriotic work of continuing to "carry on," every loyal dentist will stand up and be counted.

"Let's Finish the Job." Buy War Saving Stamps and Fifth Liberty Loan Bonds until it hurts.

THE NEW ORLEANS MEETING A GREAT VICTORY SESSION.

The leading feature of the twenty-third annual meeting of the National Dental Association at New Orleans next October will be the bringing together of all the leaders in dentistry who have served their country loyally and faithfully during the war. It will be a great victory meeting in which our confreres from other allied countries will be invited to participate and help celebrate the victory in which all have had a part.

This meeting will be a homecoming—a family reunion. It will emphasize the marked progress of dentistry during the war and the important part the dental profession has played in it. The ledger or records of the work done, the great achievements accomplished, will be balanced, and the leaders in the dental profession will give us the facts as to the progress the dental profession has made in organization, research and education during the war.

This meeting will not only report the work of the past few months and extend a glad hand of welcome to our men who have been in service, but will also outline a beacon path of education for future dentistry.

A LIST OF DENTAL OFFICERS WHO SERVED IN THE PRESENT WAR TO BE PUBLISHED.

An official list of all dentists who have seen duty as officers during the present war will be published in the 1918 transactions of the National Dental Association. A copy of these transactions will be sent to any one upon the receipt of fifty cents in stamps.

The 1918 transactions will be a historical record of the dental profession's contribution in this great war. Therefore, this bound volume will be of unusual interest to all of those dentists who are thoughtfully interested in the success of our profession. This volume is being published without any thought of profit. The sale price of fifty cents does not cover the cost of publication and mailing.

Only enough copies will be printed to fill orders received prior to March 1, 1919.

Have you returned your check for Christmas stamps?

"LET'S FINISH THE JOB."

"Let's finish the job." This slogan, which has been chosen for the Fifth Liberty Loan Drive in March, has the true American ring and it will do the work of a good slogan when the time comes. It rightly suggests that the job is not completed and it justly summons every patriotic spirit, every true loyal American dentist, to help put on the finishing touches. An enthusiastic response will mean that no more Liberty Loans will be needed.

Army and Navy

U. S. NAVAL TRAINING STATION.

Great Lakes, Illinois, Naval Dental School.

Curriculum and Teaching Hours, Naval Dental School, Conducted at Great Lakes Naval Training Station.

From Lt. Commander, A. F. McCreary, Dental Corps, U. S. Navy, officer in charge Naval Dental School, to Chief of Bureau of Medicine and Surgery, U. S. Navy.

Subject: Report of the Naval Dental School conducted at Great Lakes.

The following report of the classes under instruction in the Naval Dental School, conducted at Great Lakes Naval Training Station, is respectfully submitted.

1. Navy Regulations—Didactic Lectures 3, Quiz 1, Exam. 1.

2. Naval Customs and General Information—Didactic Lectures 2, Quiz 1, Exam. 1.

3. Clerical Work and Forms—Didactic Lectures 7, Quiz 2, Exam. 1.

4. Physical Exercise and Drill—Drills 6.

Professional Duties.

5. Anatomy, Surgical and Regional—Didactic Lectures 3, Dissection 30 hours, Quiz 10, Exam 2.

6. Surgery, War and Plastic—Didactic 5, Clinical Lectures 7.

7. Physical Diagnosis—Didactic Lectures 1, Laboratory 4.

8. Materia Medica, Pharmacology & Therapeutics—Didactic Lectures 15, Exam. 2.

9. Oral Pathology, Focal Infection & Diagnosis—Didactic Lectures 15, Clinical Lectures 1, Exam. 3.

10. Bacteriology—Didactic Lectures 4, Laboratory 2.

11. Specific Oral Lesions—Didactic Lectures 1, Clinical Lectures 1, Laboratory 1.

12. General, Conductive & Local Anesthesia—Didactic Lectures 7, Clinical Lectures 6, Quiz 1, Exam. 2.

13. Operative Dentistry—Didactic Lectures 3.

14. Mechanical Devices—Splints—Didactic Lectures 1, Laboratory 20.

15. Periodental Surgery — Didactic Lectures 3.

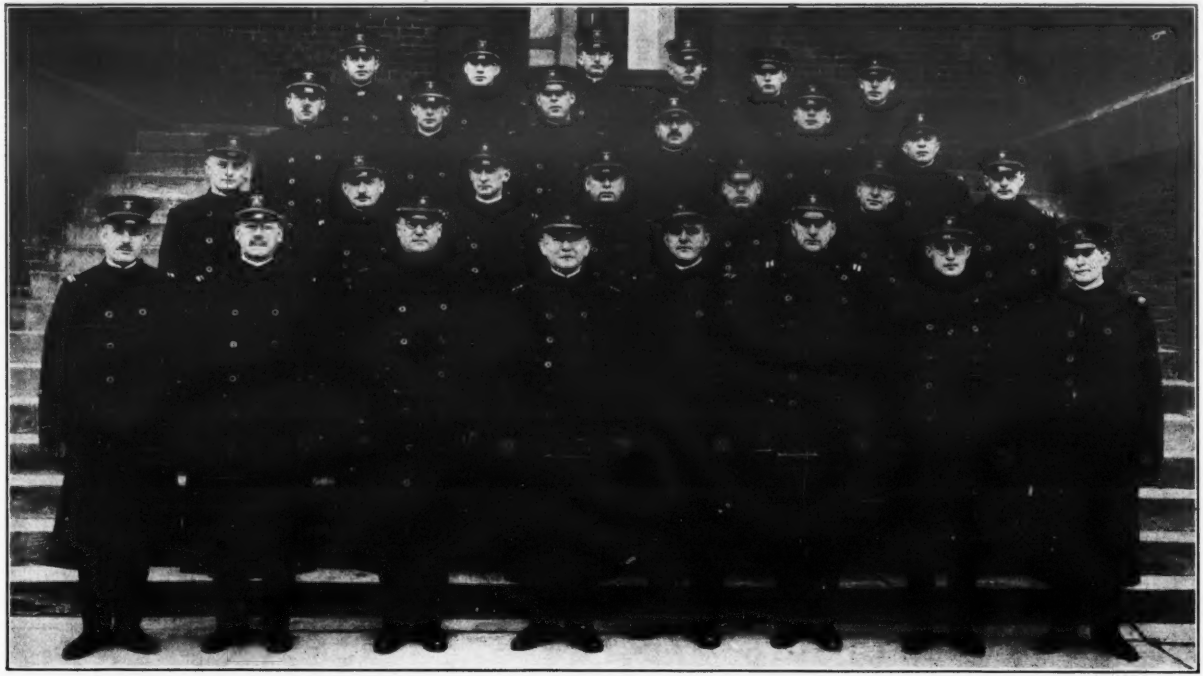
16. Radiography—Didactic Lectures 3.

Total Teaching Hours—Didactic Lectures 73, Clinical Lectures 15, Laboratory 57, Drills 6, Quiz 15, Exam 12.

Note—Night lectures on different subjects were delivered on at least three nights each week.

The object of this school being to acquaint those entering the Navy as well as those who have seen service, with the more recent practice, both military and professional, only such subjects were selected and taught in the short time allotted as could be made intensely practical.

In Anatomy and Surgery, for instance, Didactic Lectures and demonstrations each Officer was required to do a com-



OFFICERS OF THE U. S. NAVY DENTAL CORPS ON DUTY AT THE GREAT LAKES NAVAL TRAINING STATION, ILLINOIS, DECEMBER 16, 1918.

plete dissection of the head and neck, studying the vessels, nerves and bony landmarks, from the standpoint of Operative Surgery. In Mechanical Restorations he was required to construct appliances on casts taken from fractures produced on the cadavar just as in clerical work and forms he was taught to diagram and fill in forms, health records, requisitions, etc. In Oral Pathology and Focal Infections he was taught the tissue changes associating the radiograph with the color slides and by clinical cases and in Materia Medica and Pharmacology was required to study solubility and write prescriptions by both systems, etc. So in each branch every effort was made to reduce the subject to the practical equation best suited to naval life.

It is manifestly impossible to accomplish in four weeks a course, which should cover four or five months; notwithstanding the great disadvantage of instruction divided between the Station and the Chicago Dental Schools the examinations given by each instructor showed relatively high averages. From observation of the efficiency of the forty-six officers who have attended the courses at the Naval Dental School it is evident that they are more proficient and alert in their professional and military duties and there can be no question a similar course covering a period of four or five months, instead of as many weeks, would be of greater value as much important detail is necessarily omitted in the intensive short course.

If it is decided to attach the Dental School as a department to the Naval Medical School so many subjects are taught in common that only a few strictly dental instructors would be necessary and the increased cost of operation would be negligible.

It is further believed that these teachers would be officers who are already in the service or who might be accepted for such duty as well as detailed to other duties than mere instructors in the school.

Classes could be formed from new men entering the service and by relieving a small number from other duty officers already in the Dental Corps might also rotate thru this school without materially injuring the service. In this manner sufficient student material is at hand to assure the success of the school for a number of years and it is believed that the increased proficiency accruing to the Naval personnel from officers who have taken this course will more than off-set the loss of time from regular duty consumed in the school.

A FEW ORIGINAL FUNNIES.

Extracts from Letters Actually Received and Filed by the War ——— ——— ——— at Washington.

Dear Doctor King:

The following are a few extracts from letters ACTUALLY RECEIVED AND FILED BY THE WAR —— —— —— at Washington.

"I aint got no book larnin and I aint writin for not inflammation."

"She is stayin at a dissipated house."

"Just a lint to let you know that I am a widow and 4 children."

"Previous to his departure, we was married by the Justice of the Piece."

"He was inducted into the surface."

"I have a 4 months old baby and he is my only support."

"A lone woman and sparcely dependent."

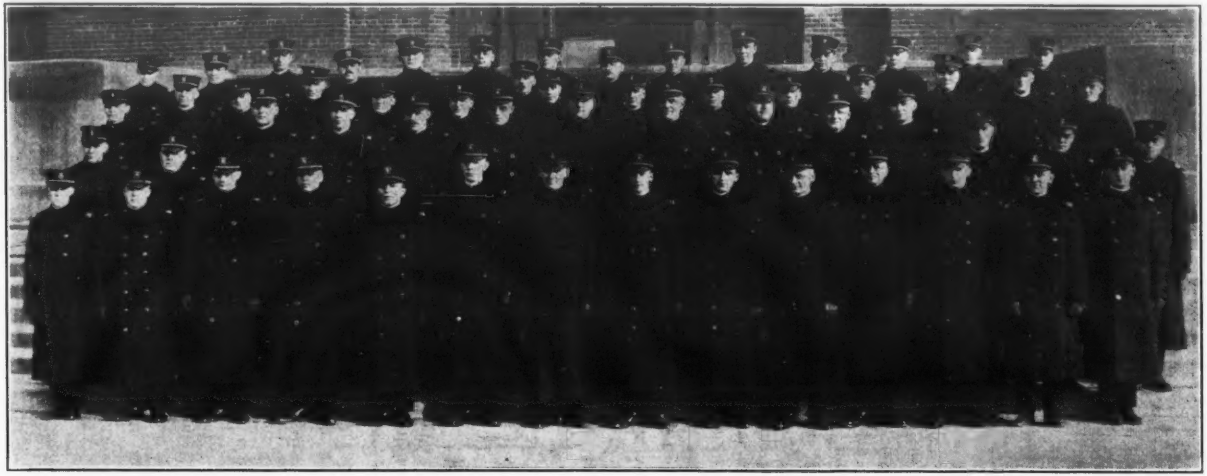
"As I need his assistance to keep me enclosed."

"Caring to my condition which I havent walked for 3 months with a broken leg which is number 75."

"Kind Sir or She:—"

"I enclose lovingly yours."

"I am left with a child 7 months old and is a baby and can't work."



OFFICERS OF INSTRUCTION AND GRADUATES OF THE SECOND CLASS NAVY DENTAL SCHOOL, GREAT LAKES NAVAL TRAINING STATION, ILLINOIS, DECEMBER, 31, 1918.

"Your relationship to him?" "I am still his beloved wife."

"In the service of the U. S. Armory."

"He was my best supporter."

"I am his wife and only air."

"You ask for my allotment number. I have seven boys and six girls."

"I am pleating for a little more time."

"Please return my marriage certificate. Baby aint eaten anything for three days."

"Date of birth? Not yet but soon."

"Both sides of our parents are old and poor."

"Please send me a wifes form."

"I have been in bed for 13 years with one doctor and I intend to try another."

"I am a widow and all I have is in the front."

"We have another war baby at our house. How much more do I get?"

"My Bill has been in charge of a spittoon. Do I get any more pay?"

"You have changed my little girls to all little boys. Will it make any difference?"

"I have not received my husbands pay and I will be forced to lead an immortal life."

"Please leave me know if John has put in a application for a wife and child."

"I aint received no pay since my husband has went into the surface."

Extract from a boy's letter to his mother at home: "I am sitting at the Y. M. C. A. writing with the piano playin my uniform."

Hoping you are the same,

——— ———.

DENTAL PRIVATES COMMISSIONED

There is a matter which I want to call to your attention, because it so illustrates many other official acts of Colonel Logan that make for his real greatness.

At the time the armistice was signed, over one thousand enlisted men who were dentists, had taken their examination for commission; their applications favorably acted upon and would soon receive their commissions as First Lieutenants. Many of these men had served as dental assistants in the various camps, for many months.

When the armistice was signed an order was issued to the effect that these applications would not be honored; these dentists who had served so long as privates, would be discharged from the service as privates.

The efforts of Colonel Logan to have these commissions issued were unavailing; he was turned down. Again he tried; same result. It would be interesting to know just how many ways and times he attempted to get this thru, without success. Ninety-nine thousand out of one hundred thousand men would have given up; sorry as they would have been to see these men go back to their homes; back to their private practice, as simply "privates," feeling they had done all possible for them. Not so our Colonel Logan. There is no man in the service who stands by his men as does our Colonel. At least not any more so.

The Colonel has not studied the winning tactics of our fighting men in France in vain. He executed a flank-and-over-the-top movement, which is bringing happiness to this thousand or more dentists; their families and patients; letting them go from the service as **Officers.**

Yes, King, he got his measure thru and these men are now receiving their commissions as First Lieutenants, as they are being mustered out of service.

This is typical of the Colonel's activity and efficiency and his loyalty to all soldiers under him. There will be universal regret on the part of all who remain in the service, when the Colonel steps out.

Sincerely yours,

——— ——— ———

DISCHARGE OF ARMY MEDICAL OFFICERS.

The officials of the Army medical department are perplexed by the requests received from medical reservists to be retained on active duty on the one hand, and the applications from the same class of officers to be discharged from military service, on the other. The policy is to release medical officers as rapidly as possible and as their services may be spared in order that those who came into the military establishment on account of the war from private practice may return thereto with the least possible delay. This, in general, is not proceeding as rapidly as some of the officers desire, and a number of the complainants have appealed to their friends in Congress for the exercise of influence in their behalf. It is, naturally, difficult to make distinctions. Care must be taken that the number of medical officers is not reduced beyond the force which is estimated as useful in taking care of the sick and wounded who are returned from overseas. General Ireland is of the opinion that the maximum number of those requiring medical treatment will not be reached much before the 1st of April, so that the reduction in the number of medical officers is bound to proceed with deliberation. At the time of the signing of the armistice there were on duty in this country about 16,000 medical officers, and since then nearly half of them have been discharged from the service. This is regarded as commendable expedition with a view to the performance of duty, which will increase rather than diminish at hospitals and at the demobilization points. Not only must medical officers be available for hospital treatment in the care of about 150,000 sick and injured, but every man who is discharged must be specially examined physically. The fact that the war is over does not by any means signify that the work of the Army surgeons has been concluded. Incidentally, the desire to leave the service in this as in other branches has produced a decline in morale among officers and enlisted men which is necessarily detrimental to efficiency—*Army and Navy Register, February 1.*

DELAYED PROMOTIONS OF MEDICAL OFFICERS.

Some impatience has been manifest among the junior officers of the regular medical and dental corps of the Army regarding the delay in their promotions. Approximately 180 first lieutenants of the medical corps have been due for advancement to captain, and 90 first lieutenants of the dental corps are in the same status. The delay has been largely due to the lack of opportunity to examine all the candidates. This difficulty was overcome, however, by the surgeon general's office, which, finding that the delays promised to continue indefinitely, recommended that all those first lieutenants of the regular medical corps who are entitled to promotion be advanced to the grade of captain, subject to examination if the opportunity had not been afforded. Some 60 of these officers have already been examined, and the examination reports are being received daily. Promotion of those who are entitled to further advancement to the grade of major will be made only upon qualifying in the examination. Similar recommendation was made to the department in the case of the members of the dental corps, who have not yet been promoted, but who are entitled to it. With the approach of peace, strong pressure is being made by many of the younger members of the regular corps to obtain their release, and the delay in the promotions has doubtless contributed somewhat to the desire for discharge. The nominations had not reached the Senate at the time we closed our forms.—*Army and Navy Register, February 1.*

PREPAREDNESS LEAGUE OF AMERICAN DENTISTS.

Expansion of the League.

Our League has made a permanent place for itself. It has proven its usefulness to the dental profession and its necessity to the welfare of humanity. Its field of operation reaches wherever organized dentistry exists, and its public service may be felt to the extreme limits of civilization. Such is a brief outline of the field of our future endeavors.

In expanding the activities of the League, we desire, however, to lay down the following unvarying rules and principles that any misconception of our aims may not occur:

1. The principle of the League is Service to Humanity.

2. Politics or promotion of personal interests shall not be tolerated.

3. It is essentially an organization for public health service.

4. Its activities shall not conflict with other dental organizations in any way.

5. Its object shall be the co-ordination of all professional and public agencies which may thereby render better service for the common welfare of humanity.

6. No officer or member of the League shall receive pay for services unless of such character as to be justifiable, but not without proper action by a quorum.

These principles must be strictly adhered to or the organization cannot live.

At a meeting of more than one hundred dentists at the Royal College of Dental Surgery, Toronto, Ontario, on December 19, 1918, a resolution was unanimously adopted for the appointment of a committee of Canadian and American dentists to meet in Buffalo, January 11, 1919, to formulate plans for an international organization, using the League plan as a basis of procedure. Our members will be informed of the results as early as possible and final action will not be taken without the approval of those interested.

The wonderful power for good of such an organization cannot be estimated. It must be truly democratic and ever ready to extend a helping hand wherever our rightful province may reach. It is impossible to outline the possibilities in a few words, but I refer you to the editorial by Dr. Kirk in the December Dental Cosmos; also that by Dr. Ottolengui in the December Dental Items of Interest.

The great opportunity for the dental profession is at hand, and a magnificent work is before us. We will accept the responsibility, with the Golden Rule as our guide, and endeavor to prove faithful to the trust. Big things are before the American public today. We must rise to the occasion and think big, act big and DO big. It is up to us to see that our profession keeps pace with the leaders.

Instruction in Post-Bellum Oral Surgery and Prosthesis.

The course of instruction given at the Royal College of Dental Surgery at Toronto in December last, was the first one given in conjunction with the League and without doubt it proved to be the best course given thus far.

The splendid faculty was composed of Lieutenant-Colonel Guy Hume and Major E. W. Cummer, representing Canada, and Arthur E. Smith, D. D. S., M. D., of Chicago, and Leroy S. Miner, M. D., D. M. D., Boston, representing the United States. This arrangement gave the meeting international significance and did much toward bringing about better relations of the profession on both sides of the border.

The Military was largely represented in the class numbering one hundred and four. Colonel Clayton, Dental Surgeon-General of Canada; Colonel W. H. Thompson, Commandant for Ontario, and several other provincial commanders were present, together with Deans Thornton of McGill University, Dubeau

of Duval and Webster of the Royal College. From the States came State Director Hallenberg, North Dakota; State Director McIntyre, Rhode Island, two League members from Nashville, Tenn., and many others scattered about the border States. Director General Tracy as well as President Beach also were present to aid in making the gathering a great success. Great credit is due Dr. Wallace Seccombe for his efforts in making necessary arangements. The course stands in a class by itself and has set a standard for the League to strive to maintain.

The League wishes it distinctly understood that this is not a post-graduate course. It is to be known as a course of instruction in post-war oral surgery and prosthesis, to which it will be strictly confined. Bearing this fact in mind, one week of instruction is ample to cover the field, except in special cases.

The course to be given in New York early in February will essentially have the same faculty. It was difficult to secure Colonel Hume and Major Cummer, but this has been brought about thru the courtesy of Colonel Clayton and Colonel Thompson. We are deeply indebted to these gentlemen for their sympathetic cooperation in this splendid work.

The League hopes to pursue this object until the States and Canada have been well covered and our members are prepared to render efficient service to our injured soldiers. The fee of $50 is divided equally among the instructors, after necessary expenses have been met, the League or the collaborating institution receiving nothing whatever.

If you are not a member of the League —join now—we need you and you need us.

J. W. BEACH, President.

DENTAL CORPS ORDERS FROM WAR DEPARTMENT.

DENTAL CORPS.

Maj. Guy P. Bannister to Washington for duty in office of attending surgeon.

Maj. George R. Tressel to Fort Slocum, N. Y., for duty.

Maj. Don G. Moore to Columbus Barracks, Ohio, for duty.

Majs. Harry B. Butler, Joseph D. Eby and Albert J. T. Beatty to Walter Reed General Hospital, D. C., for duty.

—*Army and Navy Register, Jan. 11.*

Maj. Albert Mehrer to Camp Dix, N. J., for duty.

Appointment Aug. 13, 1918, of 1st Lieut. John H. Frederick to captain in dental corps during existing emergency announced.

Lieut. Col. Julian R. Bernheim, to San Francisco, Letterman General Hospital, for duty.

Announcements

NATIONAL SOCIETIES, 1919.

October.

20-24—New Orleans, National Dental Association.

20-24—New Orleans, National Association of Dental Faculties.

20-24—New Orleans, National Association of Dental Examiners.

20—New Orleans, Delta Sigma Delta.

20-24—New Orleans, Xi Psi Phi Fraternity.

20-24—New Orleans, Association of Military Dental Surgeons.

STATE SOCIETIES.

March.

19-20-21—Vermont, Burlington.

3-4-5-6-7-8—Oklahoma, Oklahoma City.

April.

7-8-9-10-11—Alabama, Birmingham.

7-8-9-10-11-12—Michigan, Detroit.

9-10-11—West Virginia, Wheeling.

14-15-16—Missouri, St. Louis.

14-15-16—Kansas, Topeka.

15-16-17—Connecticut, Hartford.

15-17—Mississippi, Clarksdale.

20-30-May 1—Pennsylvania, Pittsburgh.

21-24—Texas, Waco.

May.

6-7-8—Iowa, Des Moines.

7-8-9—Massachusetts, Boston.

13-14-15-16—Illinois, Peoria.

19—Arkansas, Pine Bluff.

20-21-22-23—Indiana, Indianapolis.

20-21-22—Nebraska, Omaha.

California Southern, Los Angeles.

North Dakota, Fargo.

South Dakota, Mitchell.

June.

9-10-11-12—Kentucky, Louisville.

11-12-13—Georgia, Savannah.

12-13-14—New York, Syracuse.

18-19-20—Florida, Tampa.

18-19-20—New Hampshire, Manchester.

19-20-21—Colorado.

Maine. Place to be announced.

Maryland, Baltimore.

South Carolina, Columbia.

Utah, Ogden.

July.

8-9-10—Wisconsin, Milwaukee.

24-25-26—Montana, Butte.

New Jersey. Place to be announced.

October.

21—Louisiana, New Orleans.

Rhode Island, Providence.

December.

2-3-4—Ohio.

DATES TO BE ANNOUNCED.

Arizona, Phoenix.

California State, San Francisco.

New Mexico, Albuquerque.

North Carolina, Asheville.

Tennessee, Nashville.

Virginia, Richmond.

Washington, Seattle.

ANNUAL MEETING OF THE VERMONT STATE DENTAL SOCIETY.

The next annual meeting of the Vermont State Dental Society will be held in Burlington, Vermont, March 19, 20, 21, 1919.

THE OKLAHOMA STATE DENTAL SOCIETY.

The next meeting of the Oklahoma State Dental Society will be held in Oklahoma City, March 3-4-5-6-7-8, 1919.

This meeting is to be conducted along Post-Graduate lines and is entirely different from any state dental meeting in the country. The plan as so successfully carried out by the society last year consists in dividing the full attendance into classes and the members of each class take up the intensive study of one particular subject for the full week. The subjects to be taught and the teachers for this year are as follows:

Pyorrhea—Dr. T. B. Hartzell, Minneapolis.

X-Ray Root Canal and Focal Infections—Dr. M. L. Rhein, New York.

Anesthesia-Nerve Blocking—Dr. Arthur E. Smith, Chicago.

Partial Removable Dentures—Dr. F. E. Roach, Chicago.

Full Dentures—Dr. M. M. House, Indianapolis.

Operative Dentistry-Crown and Bridge Work—Dr. Willis A. Coston, Topeka.

Training Office Assistants—Dr. A. W. Starbuck, Denver.

A special series of lectures will be given the members of each class and this is to be supplemented by practical or technical instruction. The membership of each class is limited in number, thus giving an opportunity for personal instruction.

It should not require very much of an imagination to see the advantages of this plan. All the good features of the old style state meeting are retained with the added advantage of giving each member the opportunity to obtain a working knowledge of the subject he selects. A special fee is charged the members of each class and no one can take up the study of more than one subject. A few dentists, outside the state of Oklahoma, in good standing in their state society with 1919 dues paid, will be admitted to some of the classes.

The Bulletin of the Oklahoma State Dental Society which gives full details of this meeting will be mailed upon request. Anyone desiring to have a place reserved for them should communicate with the General Manager.

DR. C. R. LAWRENCE, Enid, Okla.

IOWA STATE DENTAL SOCIETY MEETING.

The annual meeting of the Iowa State Dental Society will be held in Des Moines, Iowa, May 6-7-8, 1919. An interesting program has been arranged. Men from out of the state holding National cards are cordially invited to attend all sessions.

For further information address,

DR. E. R. SWANK,
C. N. B. Bldg., Des Moines, Iowa.

KENTUCKY STATE DENTAL SOCIETY MEETING.

The Fiftieth Anniversary—Jubilee Meeting—of the Kentucky State Dental Association will be held in Louisville, Ky., June 9-10-11-12, 1919.

A Post-Graduate course of unusual interest has been planned.

Address all correspondence to

W. M. RANDALL, Sec'y.,
1035 Second St..,
Louisville, Ky.

ALUMNI SOCIETY OF THE DEWEY SCHOOL OF ORTHODONTIA.

The Alumni Society of the Dewey School of Orthodontia will hold their next annual meeting in St. Louis March 6, 7 and 8, 1919. The usual high standard of the meetings of this society will be maintained. All interested in Orthodontia are welcome. Address communications to Dr. George F. Burke, 741-43 David Whitney Bldg., Detroit, Mich.

ANNUAL CONVENTION OF THE TEXAS STATE DENTAL SOCIETY.

The thirty-ninth annual convention of The Texas State Dental Society will be held at Waco, Texas, April 21st to 24th, 1919.

Several men of national prominence will conduct the post-graduate feature of the meeting, which will supplement the program of papers and clinics by members of the Society.

J. G. FIFE, Secretary,
736 Wilson Building,
Dallas, Texas.

THE DENTAL SOCIETY OF THE STATE OF NEW YORK.

The Dental Society of the State of New York will hold its 51st annual meeting June 12, 13, 14, 1919, at the Hotel Onondaga, Syracuse, N. Y. All ethical dentists, residents of New York and those residing in adjoining states are cordially invited to be present at the sessions of the Society.

Dr. A. C. Bickelhaupt, City Bank Bldg., Syracuse, N. Y., is Chairman of the Exhibits Committee.

A. P. BURKHART, Secretary,
52 Genesee St., Auburn, N. Y.

ANNUAL MEETING OF THE ALUMNI SOCIETY OF THE PHILADELPHIA DENTAL COLLEGE.

The annual meeting of the Alumni Society of the Philadelphia Dental College (Temple University) will be held on Wednesday, April 16, 1919, in the College Building at 18th and Buttonwood Sts. All members should be present.

FRANKLIN S. FLUCK,
Chairman of Publicity Committee,
2440 North 7th St.,
Philadelphia, Pa.

MISSISSIPPI BOARD OF DENTAL EXAMINERS.

The next meeting of the Mississippi Board of Dental Examiners will be held in the Senate Chamber, State Capitol, Jackson, Miss., on the third Tuesday in June. For application blanks and further information address,

B. J. MARSHALL, Secretary,
6-7 Turner-Cox Bldg., Marks, Miss.

IOWA STATE BOARD OF DENTAL EXAMINERS.

A special meeting of the Iowa State Board of Dental Examiners for the examination of applicants will be held at Iowa City, Iowa, commencing March 10, 1919, at 9:00 A. M.

For further information address the secretary,

DR. J. A. WEST,
417 Utica Bldg., Des Moines, Ia.

AMERICAN SOCIETY OF ORTHODONTISTS.

The Nineteenth annual meeting of the American Society of Orthodontists will be held in St. Louis, Monday, Tuesday, and Wednesday, March 10th, 11th and 12th, with headquarters at the Planters Hotel. An excellent program is assured.

F. M. CASTO, Secretary,
458-464 Rose Bldg., Cleveland, O.

BACK COPIES OF 1918 JOURNAL.

Several of the medical and dental libraries need extra copies of the 1918 Journal. This volume will be bound and placed on the shelves of the library for reference work. Therefore, if our readers who do not intend to bind this volume will send it to us, by express, collect, we will appreciate it.

DR. OTTO U. KING, Sec'y,
National Dental Association,
127 No. Dearborn St., Chicago, Ill.

Deaths

DR. G. L. TUCKER DIES IN SERVICE.

Dr. Garland Lee Tucker, son of Dr. and Mrs. D. W. Tucker, 843 Park Ave., died at Camp Fremont, Palo Alto, Calif., last November, following a short illness of pneumonia. Dr. Tucker, who was attached to the Eighth Division, U. S. Dental Corps, had just written his parents to the effect that he had passed his examination for a commission, and had it not been for his illness, he would have been on the troop train en route to a point of embarkation for France from Camp Fremont, that was wrecked at Geneva, Ill., just recently.

GARLAND LEE TUCKER.

Dr. Garland Tucker Dies at Camp Fremont, Calif., of Pneumonia.

Dr. Garland Tucker, 27 years old, son of Dr. and Mrs. D. W. Tucker, 843 Park Ave., died at Camp Fremont, Calif., last November, following a short illness of pneumonia.

Pvt. Tucker, who was graduated from the Northwestern University in 1915 and attended Notre Dame University, enlisted in June of this year, and has been stationed ever since then at Camp Fremont in the 8th division of the Dental Corps. He had just taken an examination for lieutenancy prior to his death.

Before enlisting Dr. Tucker was engaged in the dental practice in South Bend and Mishawaka.

Besides his parents he is survived by three sisters, Mrs. H. F. North, and Mrs. F. W. McCallum, of this city, and Mrs. H. M. Kensill, of Elkhart.

Lieutenant Vance Wilbur Bliss—Second son and youngest member of the family of Dr. and Mrs. Frank Wilbur Bliss; born in Santa Cruz, California, June 13, 1891. Graduated from the College of Dentistry at San Francisco, with the University of California Degree of

D. D. S. in the Class of 1913; commenced dental practice in association with his father at Santa Cruz. Enrolled in the National Army of the United States by voluntary enlistment, on examination at San Francisco, May 12, 1917; was comsioned First Lieutenant in the Dental Section, Officers Reserve Corps, September 5, 1917, and assigned to duty at Camp Fremont. Ordered overseas with the 319th Engineers, of the American Expeditionary Forces, his division embarked at New York September 25, 1918, and proceeded under convoy to Liverpool; he landed there sick with a cold contracted aboard the Transport, which rapidly developed into a fatal case of double pneumonia, terminating in death October 12, 1918, in the Military Hospital at Blundell Sands, England.

Frederick L. Bogue, Montclair, N. J.; Dental Department, University of Pennsylvania, 1894; Medical Department, University of Pennsylvania, 1895; aged 48; a member of the New York State Dental Society and the National Dental Association; died at his home October 26th from heart disease.

William R. Chaplin, Savannah, Georgia. University of Pennsylvania, 1898. President First District Society of Pennsylvania (formerly Savannah Dental Society). Aged 50 years. Died at a local hospital on January 18th of influenza-pneumonia.

Lt. George W. Mattox, Elberton, Ga.; graduated from Southern Dental College, Atlanta, Ga., May 28th, 1917; practiced one year in Elberton; aged 24; died October 15th on board the Kroonland-bound for France—of bronchial-pneumonia resulting from influenza.

A. A. Mahle, Lemont, Ill.; born April 1, 1872, Peoria, Ill.; graduated from Northwestern University Dental School in 1901; came to Lemont, Ill., in 1901, practicing there for seventeen years; founded the Commercial Club of Lemont and was President of the Club the first year; member of the Odd Fellow's Lodge, Knights of Pythias and Rebekah Lodge; member of the Illinois State Dental Society and the National Dental Association; died at his home on Singer Ave., October 28th, from pneumonia.

Paul Francis McNamara, Spring Valley, Ill.; Northwestern University Dental School, 1916; Member of the Illinois State Dental Society and the National Dental Association; Examined for the Dental Reserve in August and received Commission October 9, 1917, but was not called for active service; aged 26; died at St. Margaret's Hospital, October 19, after one week's illness caused by influenza-pneumonia.

"In Memoriam" Resolutions.

The following "In Memoriam" Resolutions on the death of Dr. Garland Tucker, from the St. Joseph County Dental Society:

Whereas, an all-wise Providence in His infinite wisdom has taken from our midst thru death one of our highly esteemed and well beloved members, Dr. Garland L. Tucker; and

Whereas, his life, work and association have been an example and stimulus to the many who new him well and were privileged to come under his influence; and

Whereas, his usefulness as a citizen, practitioner and member of this body, has ever been strikingly commendable in every respect; therefore, be it

Resolved, by the St. Joseph County

Dental Society that its membership keenly feels the loss thru his demise and hereby gives expression to its sincere sympathy with his family in their period of sadness; be it further

Resolved, that by the death of Dr. Tucker, the profession of dentistry has lost an energetic, ethical and worthy representative, and this body a devoted, loyal and helpful member; and be it further

Resolved, that a copy of these resolutions be spread upon the minutes of the Society, a copy forwarded to his parents.

T. J. WALSH, President.

R. D. DUGGAN, Secretary.

Dated at South Bend, Indiana, this 11th day of November, 1918.

MEMORIAL.

In honor of 1st Lieutenant Winfred E. Henshaw, Dental Corps, Assistant to the Attending Surgeon, Central Department United States Army, Chicago.

Whereas, Lieutenant Winfred E. Henshaw, an officer of the United States Army, departed this life on the 28th day of September, A. D. 1918, and

Whereas, Lieutenant Henshaw was commissioned in the Medical Reserve Corps of the United States Army in July, 1917, and was transferred to the Regular Army in December, 1917, in the Dental Corps, and

Whereas, in the month of April, 1918, he was sent to Camp Greenleaf for a course of instruction, and

Whereas, he was later assigned to Headquarters Central Department as Assistant to the attending Surgeon, and

Whereas, he was a member of the Chicago Dental Society, the Illinois Dental Society and the National Society, as well as various other organizations, including the Sojourners Club of Chicago.

Now, therefore, let it be known, that to those who knew him in the practice of his profession, Lieutenant Henshaw was a valued friend; he had the confidence of his patients, the admiration of his coworkers; he was not only skillful in the practice of the dental profession, but he was always willing and ready to perform his duties so that it was a pleasure to go to him for professional advice; he was the kind of friend who endeared himself to one the longer he was known; and he will be missed by those who had the pleasure of associating with him, and be it further

Resolved, that the Sojourners Club of Chicago, of which Lieutenant Henshaw was a member and Secretary at the time of his death, records its deep appreciation of the cordial fellowship that has always existed between him and the other members of the Club, and a keen sense of loss on the part of all of the members of the Club at his death, and be it further

Resolved, that a copy of these resolutions be spread upon the records of the Sojourners Club; that an engrossed copy thereof be furnished to his family, and that copies thereof be sent to the members of the professional societies of which he was a member, and to the professional school of which he was a graduate.

Adopted the 13th day of November, A. D. 1918.

NATHAN WM. MAC CLUSNEY,
President,
Lt. Colonel U. S. A.

HOWARD T. ABNEY, Secretary,
2nd Lieutenant, I. M. C., U. S. A.

The above resolutions were adopted by a rising vote of the members of the Sojourners Club, at a meeting at the Hotel LaSalle, in the City of Chicago, on the 13th day of November, A. D. 1918.

HOWARD T. ABNEY, Secretary,
2nd Lieut., Q. M. C., U. S. A.

Attest: Geo. F. Mumaels, Vice-Pres.
Lt. Colonel, M. Corps.

RESOLUTIONS PASSED BY THE ENGLEWOOD BRANCH OF CHICAGO DENTAL SOCIETY, NOVEMBER 12, 1918.

Died October 14, 1918, at Camp Zachary Taylor, Kentucky, from Spanish Influenza, Major Merton Meyne Postle.

Dr. Postle, (as he was more commonly known to us) was born at Ironton, Ohio, December 23, 1879.

Of his early life we have nothing, but it is fair to assume that it must have been a useful one for he could not have attained the high standing in his profession and in military life had he not been endowed with the necessary training and qualities which must be present in forming the foundations for such a useful life. In October, 1909, Dr. Postle entered the Northwestern University Dental School and was graduated from that institution in 1912.

From February to June of the following year he was a demonstrator in operative dentistry in the Northwestern University Dental School. During the school years of 1913-14 and 1914-15 he was clinical instructor in Prosthetic Dentistry and from this time until he entered the army he was assistant professor of the same department.

Soon after our government declared war against Germany Dr. Postle's patriotism rose supreme and he volunteered his services to the government, entering the Dental Officers Training School and was assigned to duty at Camp Grant cantonment, September 25, 1917, with the rank of First Lieutenant, U. S. A.

From November 19th to December 15th, 1917, he took a special course in the Officers School of Plastic and Oral Surgery established by the order of Surgeon General of the army.

On May 25th, 1918, he was made a captain.

August 31, 1918, he was promoted to a Major, and assigned to Camp Zachary Taylor, Kentucky, where he faithfully performed his duties until his death.

He made himself honored and respected by his Dental Profession, was an active member of our Dental Society and in 1917 was made President of his Alumni Association. He was always zealous in promoting his interests and was ever ready to help elevate the standard of his profession.

Sacrificing his practice, leaving his wife and babies and risking his life for humanity is ample proof of his patriotism. Words are a frail coinage of the soul and the gratitude we have for such a patriot finds inadequate voice. Therefore, be it

Resolved:—That in the death of Major Postle the members of this society have suffered a great loss. Thru association with him in our work we have learned to honor and respect him as a brother co-worker and to look upon him as a consistent Christian man.

Resolved:—That an expression of our sympathy and condolence be extended to his bereaved family.

Resolved:—That a copy of these resolutions be filed with our Secretary and a copy sent to the Dental Journals for publication and also a copy to his family.

(Signed) J. P. SMITH,
Chairman Resolutions Committee.

Very truly yours,
RAYMOND J. SAUER, Secy.